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NOTES FOR THE MONTH.

THE Departmental Committee on Distribution and Prices of Agricultural Produce has issued its fourth Interim Report* dealing with cereals, flour and bread. This is the last section of the Committee's inquiries, and a final report, reviewing the general results of its investigations will be produced in due course. During the inquiry into cereals, flour and bread the Committee held 16 meetings and heard evidence from 40 witnesses, representative of farmers, corn-merchants, millers, bakers and consumers throughout Great Britain.

The report contains a systematic account of the marketing and distribution of home-produced wheat, barley, and oats, the milling and distribution of flour, and the cost of baking and distribution of bread. The expenses and profits of millers and bakers were investigated, and their reasonableness or otherwise is fully discussed.

The section of the report which will probably interest farmers most is that dealing with the successful efforts recently made to breed a wheat with the high yield of the typical English varieties, which would in addition command the prices paid for Canadian and some other imported wheats. Such a variety is now available to farmers in "Yeoman."

The Committee concludes by stating, "We have investigated the system of distributing cereal crops and found it to be, on the whole both simple and inexpensive. So far as the manufacture and sale of bread is concerned, we have shown that the time has come for many bakers to reduce their prices consequent on recent reductions in costs, notably in the price of flour."

"We have emphasised that, as the farmer cannot look for any immediate and material improvement in the price he obtains

* The report can be obtained through any bookseller or direct from H.M. Stationery Office, Imperial House, Kingsway, W.C.2. (Price 3s. net.)

for his wheat by alterations and economies in the established methods of production and distribution of either flour or bread, a steady and permanent improvement in prices is to be sought by enhancing the intrinsic commercial value of the wheat he grows. This he can do by concentrating on the production of newly evolved varieties of wheat of high milling quality. Indeed, up to the limits of available supply, there is even now no reason why consumers should not be supplied with a high-class all-English loaf if farmers will grow suitable wheats, if millers will manufacture the flour, if bakers will use it, and if all three combine to make the merits of this all-British product known to the public. The creation of an articulate demand is essential. The natural play of economic forces will determine the course events will take, but if for wheat of high-milling quality the farmer ultimately obtains the higher price to which he is or will be fully entitled, while, at the same time the improved varieties yield satisfactorily, wheat production in this country would receive much-needed encouragement."

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FARMERS in certain districts are uncomfortably aware of what is involved locally by an outbreak of foot-and-mouth disease,

Distribution of Foot-and-Mouth Disease.

and all concerned would be highly gratified if the chief means of its distribution could be discovered. It is a simple matter perhaps to show that many neighbouring outbreaks have been due to contact in markets, or to the distribution of affected animals from a big market. It is quite another matter to determine the origin of many an initial outbreak which may have occurred on an isolated farm on which movement of stock has not taken place. For this reason the article by Sir Stewart Stockman and Miss Marjory Garnett at p. 681 is of special interest.

For some years past the Ministry's Chief Veterinary Officer has had under examination the possibility of the distribution of the virus of foot-and-mouth disease by birds, which it was considered might introduce the disease when migrating from other countries in which it is very prevalent. The authors have investigated the possible relationship between bird migration lines and the outbreaks of foot-and-mouth disease over the past twenty years, and they now detail their results. The problem was approached with an open mind, but the authors did not find it possible to establish a negative; while some factors are uncertain it seems that there are very clear relations, both as

regards seasons and localities, between bird movements and initial outbreaks of foot-and-mouth disease.

It may be added that Sir Stewart Stockman is now carrying the investigation further, by seeking to determine by experimental evidence whether birds do actually convey the virus.

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THE article by Mr. J. W. Hurst in this issue (p. 715) draws attention to the opportunity which undoubtedly exists for British

The Farmer's Poultry.

farmers to develop with profit a subsidiary branch of their operations. Before the War about 50 per cent. of the eggs imported into this country were produced in Russia. Practically none of these eggs were the product of specialised egg farms, but originated on the small holdings of the Russian peasantry. Even the large supplies which were imported from Denmark and Ireland before the War, and which still arrive in approximately the same quantities, are produced on general farms. In fact, in every poultry-producing country it may be said that by far the greater bulk of the poultry and eggs produced are the result of the poultry husbandry of the general farmer.

The United States of America, which supplies all the requirements in poultry produce of its population of 110 millions, maintains more than half its total poultry—amounting in all to over 370 million birds—on general farms in the corn belt, and increasing interest in poultry and egg production is being shown by the farmers in these districts. That is not to say that the general farmer in America is devoting more attention to poultry keeping from mere love of the work. On the contrary it is proverbial that in the past the general farmer has disliked poultry and has looked upon them with contempt. Sheer necessity, however, has driven him into active endeavour to take advantage of the opportunity for making the profits offered by keeping poultry on his farm. This is to some extent true of the English farmer.

The present opportunity offers a much wider scope for the development of poultry keeping in this country; but the opportunity is not likely to continue indefinitely. Farmers in countries all over the world are increasing their output of eggs and poultry, and their marketing organisations are in nearly every case endeavouring to secure a footing in the British market, which is the greatest importing market in the world for eggs and poultry. Competition from abroad is therefore likely to become keener; but the man in possession of a market

always has an advantage over a newcomer, and if the English farmer produces and markets in proper condition, a first-grade English egg—which no foreign country can supply—he will not only obtain a benefit for himself in these days of agricultural depression, but will confer a benefit on the nation by reducing the sums paid abroad for imported food.

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A GOVERNMENT Pavilion is being erected at the British Empire Exhibition at Wembley in which will be shown various Government activities of interest to the Empire. Agriculture will be included, and exhibits are being prepared by various Research Institutes throughout the country in co-operation with the Ministry and the Board of Agriculture for Scotland. The object will be to show, in an attractive and popular manner, the practical application of research to agriculture, and the display should be of the greatest value and interest to agriculturists.

It is proposed also to show various phases of agricultural activities on the cinematograph, and it is hoped to arrange for a series of lectures by eminent authorities. The research exhibit will be explained by guide lecturers. In addition to this review of the assistance given by the Government to agriculture, in the Government Pavilion, a model working dairy is being erected by the National Milk Publicity Council which will be equipped with all the latest improvements in modern dairy appliances.

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In the October issue of this *Journal* was published the Ministry's Report for the year ending 31st March, 1923, on the schemes for the improvement of live stock and light horse breeding. The report shows that a good deal has been accomplished in this direction within the limited scope allowed by the economic stricture of the period.

It cannot be too often stated, or too fully realised how important a part breeding of live stock must play in the revival of the agricultural industry of the country. It has been for many years the proud boast of the British breeder that his pedigree live stock had a world-wide reputation for its excellence, and before the War there was a wide demand from the overseas dominions and foreign countries for animals from the pedigree herds, flocks and studs of this country. This trade

was seriously damaged by the War and subsequent developments, and now that it is reviving with the general demand for fresh stock, every effort is required to maintain and enhance the pre-eminence of British live stock in the world market.

The importance of good breeding too in its relation to the food supply and to the military requirements of the country has been emphasised by the events of the last decade, and these considerations should make the progress shown in the Ministry's report on its improvement schemes of special interest.

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THE Treasury has appointed a Committee to consider the various methods of levying a Customs Duty upon imported

**Customs Duty
on Imported
Malting Barley.**

malting barley, and to report what, in their opinion, is the most convenient form of duty. The Committee is constituted as follows:—

Captain M. Falcon, M.P. (Chairman).

Mr. George Bull, C.B.E., representing the National Association of Corn and Agricultural Merchants.

Mr. H. D. Cherry-Downes, representing the Maltsters' Association of Great Britain.

Mr. H. Fountain, C.B., representing the Board of Trade.

Mr. Harry German }
Mr. Cleveland Fyfe } representing the National Farmers' Union.

Mr. J. Holman, representing the National Federation of Corn Trade Associations.

Mr. W. H. Pascoe, representing the Customs and Excise Department.

Mr. Hugh F. Paul.

Mr. W. H. Ross, representing the Whisky Association.

Major E. A. Ruggles-Brise, M.P.

Mr. R. J. Thompson, C.B., O.B.E., representing the Ministry of Agriculture and Fisheries.

Mr. S. R. Wells, M.P., representing the Brewers' Society.

Sir David Wilson, Bart.

Mr. E. S. Bartenshaw, of the Customs and Excise Department, and

Mr. R. Ross, of the Ministry of Agriculture and Fisheries, will act as Joint Secretaries to the Committee.

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In the October issue of the *Journal* attention was drawn to the National Rat Week which has been fixed this year for the period 5th to 10th November. This is an

**National
Rat Week.**

opportune time for farmers and others to make war on rats and mice with the greatest possible chance of success, and eventually to take collective action as enjoined by the Rats and Mice (Destruction) Act, 1919. Application for advice should be made to the local

authority responsible for the administration of the Act, or to the Ministry of Agriculture and Fisheries. In those areas where systematic destruction has been instituted, a great reduction in the number of these pests has taken place. Rats and mice serve no useful purpose in the economy of the farm, but only consume and destroy large quantities of food stuffs. Their eradication is a direct boon to the occupiers of premises in which they have taken up their abode.

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A FURTHER rise was recorded in September in the average prices of agricultural produce, the general index number advancing from 54 per cent. above pre-war **The Agricultural Index Number.** in August to 56 per cent. above in September. There has thus been a rise of 5 points from the minimum of June, and although the prices of different commodities vary appreciably, the general level is now practically the same as a year ago. The increase in September was due in the main to fruit and barley, the index figure for the former advancing sharply owing to the very high prices of plums and pears as a result of the poor crops. Small fruits which were on the market last month were relatively much cheaper than plums and pears.

The following table shows the percentage increase in each month since January, 1920:—

PERCENTAGE INCREASE COMPARED WITH THE AVERAGE OF THE CORRESPONDING MONTH IN 1911-13.

MONTH.	1920.	1921.	1922.	1923.
January	200	183	75	68
February	195	167	79	63
March	189	150	77	59
April	202	149	70	54
May	180	119	71	54
June	175	112	68	51
July	186	112	72	53
August	193	131	67	54
September	202	116	57	56
October	194	86	59	—
November	193	79	62	—
December	184	76	59	—

The average price of wheat during September was only 19 per cent. above pre-war, compared with 23 per cent. above in September, 1922, and there was a sharp decline as compared with August, 1923, during the early weeks of which most of the wheat on the market was of last year's crop. With more barley of malting quality on sale, prices showed a sharp rise on the month, and at 30 per cent. above 1911-13, were higher than a year ago. Oats declined by about 4d. per cwt., but as this

reduction was relatively the same as in pre-war days, the index number remains unchanged at 80 per cent. above 1911-13. The prices of grain continue at a lower level than those of other kinds of agricultural produce, though hay at only 32 per cent. above pre-war is relatively little dearer than barley or oats. Hay prices showed very little change on the month, but usually these harden in September, so that the index figure declined by 2 points.

The average price of main crop potatoes during September was 75 per cent. above pre-war, whereas in September last year they were down to the pre-war level. There was, however, a pronounced decline during the latter half of the month owing to the markets being over-supplied, and in the week ending 26th September potatoes averaged about 60 per cent. above 1911-13.

Fat cattle were 2d. per stone cheaper than in August, but as prices have declined during the last two months at relatively the same rate as before the war, the index number has remained practically unchanged since July. The prices of fat sheep have been very steady since mid-August, but over the whole of September averaged $\frac{1}{4}$ d. per lb. less than in the previous month. The index number declined from 76 to 72 per cent. above pre-war, but fat sheep are still relatively much dearer than fat cattle or pigs. The rise in the prices of fat pigs which took place during August has not continued, though there has been no falling away, so that the average for September is about 4d. per stone higher than for August, and the index number shows a rise of 8 points to 55 per cent. above September, 1911-13.

Dairy cows usually advance in value in the late summer and autumn, but the increase of about 15s. per head in September was relatively rather greater than usual. Although there was some improvement in the demand for store cattle towards the end of the month trade was slack on the whole, and the index number shows a slight decline. Store sheep have, however, continued in good demand, and the increase of 2s. per head on the month brings this class of stock to more than double the pre-war level. Store pigs show a further decline and average 95 per cent. above 1911-13, as compared with 102 per cent. above in August. All classes of live stock except store sheep are cheaper than in September, 1922.

The prices received by farmers for milk remained unchanged in September at 67 per cent. above 1911-13, but the rise in the price of butter as compared with August was rather sharper

than usual at this season, and the index number moved from 48 to 56 per cent. above pre-war. Cheese also became dearer and rose to 74 per cent. above 1911-13. Cheese was 24s. per cwt. dearer than in September, 1922, whilst butter was 2½d. per lb. cheaper.

As is usual at this time of the year eggs showed an appreciable rise, being nearly 8d. per dozen dearer than in August, the index number increasing from 68 to 75 per cent. above pre-war.

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The Cumberland and Westmorland Committee have extended their current agreement to cover the hiring period 11th November, 1923, to 7th June, 1924. The terms are as follows:—

Conciliation Committees

in Agriculture.

in Agriculture.	Skilled male workers aged 21 and over	37/-	} For a week of customary hours (defined as 63).
	Skilled male workers aged 20 and under 21	... ..	32/-
	Skilled male workers aged 18 to 20	... ..	28/-
	Skilled male workers aged 16 to 18	... ..	23/-
	Other adult male workers 30/- for a week of 54 hours in summer and 48 in winter.			

Female workers aged 16 and over, 5d. per hour.

Provision is also made for overtime to be paid for at the rate of 8d. per hour and for the value of board and lodging to be computed at 15s. per week for all male workers of 16 years of age and over.

The agreement of the Devonshire Committee, which was due to expire at the end of September, has been extended to 5th January, 1924, with the understanding that unless either side asks for re-consideration it will continue to Lady-day. The terms provide for the payment to adult male workers at the rate of 30s. for a week of 51 hours, with overtime at 8d. per hour on weekdays and 10d. per hour on Sundays. Rates of wages for male workers under 21 years of age and the values at which the provision of board and lodging may be reckoned are also included in the agreement.

The Merioneth and Montgomery Committee have also decided to maintain wages at the present level, the current agreement having been extended to 30th April, 1924. The rates are 31s. for a guaranteed week of 60 hours for stockmen (the guaranteed weekly wage for these workers being a new feature of the agreement), 28s. for a week of 52 hours for other adult male workers and proportionate rates for male workers under 21 years of age.

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BIRD MIGRATION AND THE INTRODUCTION OF FOOT-AND-MOUTH DISEASE.

SIR S. STOCKMAN,

Chief Veterinary Officer, Ministry of Agriculture and Fisheries,
and

MISS MARJORY GARNETT.

IN an article entitled "The Question of Invasion" prepared by the senior author (S. S.) for his Annual Report in 1919* he discussed the problem of invasion of this country by foot-and-mouth disease in the light of what seemed to emerge from studying the outbreaks over a period of 20 years. Since then further outbreaks have been considered (1919-1921) but, although these necessarily increase the number examined, the alteration in the incidence of locality is negligible, and no entirely new facts of importance have come to light. By examining the recorded stories of outbreaks, it was found possible to classify them under two important heads:—(a) Initial outbreaks of invasion; (b) Outbreaks of ramification from the former.

Those in (b) require no further explanation for their classification.

As regards those placed in (a), they are those which arose after the country had been free from the disease for more or less long periods—months or years—in excess of what there is reason to believe represents the usual viability of the virus outside the body, and those arising simultaneously in parts of the country very remote from each other and having no possible connection, except perhaps through the same agency, whatever it be, whereby the virus is carried long distances and in certain directions. This apparently is the same problem as that of invasion from without the country. In this particular connection it has to be noted:—

(1) That the entry into Great Britain of ruminants and swine was totally forbidden, as was also the importation of straw and hay from any infected country; yet the outbreaks of invasion continued.

(2) That the outbreaks were dealt with by slaughter, and the question of recovered carriers of infection did not therefore arise.

* *Annual Report of Proceedings under the Diseases of Animals Acts, Ministry of Agriculture*; see also *Journal of Comparative Pathology and Therapeutics*, Vol. XXXIII, 1920.

(3) That all infected premises, after slaughter of the animals, were disinfected both chemically and by prolonged isolation as regards fresh stock entering thereon, and were never attacked more than once.

Possible Carriers of Infection.—Feeding stuffs and packing materials imported from abroad, and human beings who had come from foreign countries, fell under suspicion as the mechanical carriers of infection in general, for the evidence is definite in connection with the outbreaks of ramification that infection can be carried by human beings, by food stuffs, and by straw. Although on inquiry it very occasionally transpired that one or other of these possible agencies might have been the origin of an initial outbreak, in the vast majority of cases there was no such evidence, and in many cases the initial outbreaks arose on more or less isolated farms, where nothing but home-grown material had been used; at which no strangers had visited; and off which the residents and attendants had not been for some considerable time before the outbreak. Additional and strong evidence against imported materials of commerce or human beings from abroad being generally responsible for the introduction of infection was brought out from the fact that the distribution of the initial outbreaks did not follow the lines of distribution of the imported food stuffs, etc. Human beings, and imported food stuffs, go to all parts of the country, but it transpired, in fact, that the greater part of the United Kingdom had escaped outbreaks of initial invasion, and that these, over a period of 22 years, had arisen almost entirely in more or less definite areas, some of these, again, being much more favoured than the others. The same premises in these areas, moreover, were practically never stricken a second time, a fact which finally demolished the improbable suggestion that infection might have lain latent from a previous outbreak. The distribution of these initial outbreaks of invasion was sufficiently definite to justify the conclusion that it did not arise from purely fortuitous circumstances. As is well known, the invasions of this country occur during the waves of prevalence of foot-and-mouth disease on the Continent of Europe.

Human beings, imported animals, and food stuffs—the ordinary communication between farm stock and the outer world, as it were—having been eliminated as agencies of conveyance in general, it seemed worth while examining the possibility of the virus being air-borne, particularly through the agency of birds. It is worthy of mention here that

publication of the article previously referred to (Annual Report, 1919) has aroused special interest amongst the inspectorate staff of the Ministry of Agriculture dealing with outbreaks in the field, and some of them in their reports have been able to furnish actual and personal observations, which tend to show that in connection with outbreaks of ramification, at least—outbreaks arising, say, up to a few miles apart from each other—birds are responsible for carrying infection. The reports also contain the information that at the time of certain initial outbreaks flocks of birds (place of origin unknown) had been observed in the neighbourhood, and even on the farm where infection arose.

In outbreaks of ramification birds (chiefly starlings, rooks, crows, wood pigeons and gulls) have been seen to feed at the troughs used by affected animals at pasture, and to fly to other farms nearby, where disease subsequently broke out, notwithstanding there had been no other known communication between the premises.

In considering the way in which birds might carry infection, three possibilities suggested themselves :—

(1) The birds might contract an attack of the disease in some form. Birds in general are known to be very insusceptible to the disease, but there are recorded cases which seem to show that this species-insusceptibility is not absolute. Therefore, given only a few susceptible birds affected with the disease, amongst the millions which migrate to this country, this explanation would not outrage the observations as to incidence.

(2) That by frequenting infected pastures, etc., the birds might contaminate their feet or plumage with the virus, and afterwards carry it over long distances to other pastures, etc. This is definitely possible, since we know that the virus, so long as it can find the conditions for maintaining its viability, can be carried on straw, hay, clothes, etc., and feathers might warrantably be included.

(3) That the virus might be swallowed (in food or water) by birds, pass through their intestines uninjured, and afterwards be excreted in their droppings at places remote from where the virus was picked up.

The object of this article is to deal with the circumstantial evidence, without, for the moment, dipping into the experimental evidence, such as it is at present. It is a remarkable fact, however, that initial outbreaks of invasion practically

never arise amongst animals which are completely housed, and the ramifications from initial outbreaks are infinitely more numerous if invasion* occurs at seasons when most of the animals are at pasture. The spread of the disease from premises to premises, moreover, can be checked to a remarkable extent if owners can be prevailed upon to keep their animals indoors, which may, of course, at times be impossible, for obvious reasons.

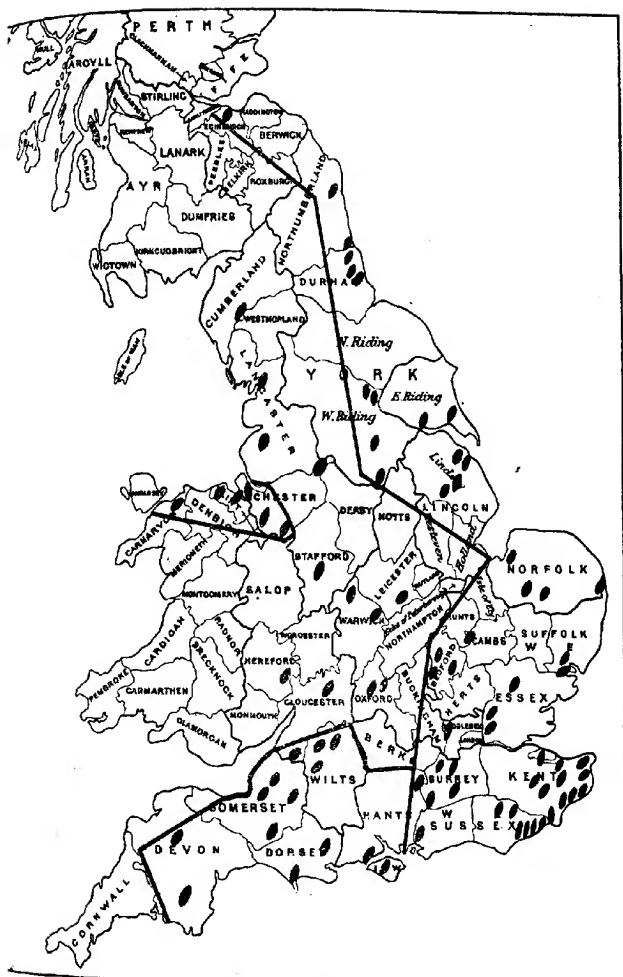
A map of the initial outbreaks—80 in number—over a period of 22 years, was filled in (see Map 1, which is a summary, as it were, of the principal map). A chart was also constructed showing the monthly incidence of the initial outbreaks in each year of the 22; the totals are summarised in Table I.

It is upon the above records and circumstances that the junior author* has brought to bear her studies on birds and their movements, a subject which has occupied her attention for many years. To prevent misunderstanding, however, it should be explained that, both the authors being aware that a positive was practically impossible to prove under the circumstances, the object of the inquiry in the first instance was to see whether the question could not be definitely settled by proving a negative, that is to say, by finding the circumstances of invasion so out of accord with those of bird movements that the theory could not be entertained. This it is hoped will relieve the authors of any imputation of a desire to engage in special pleading.

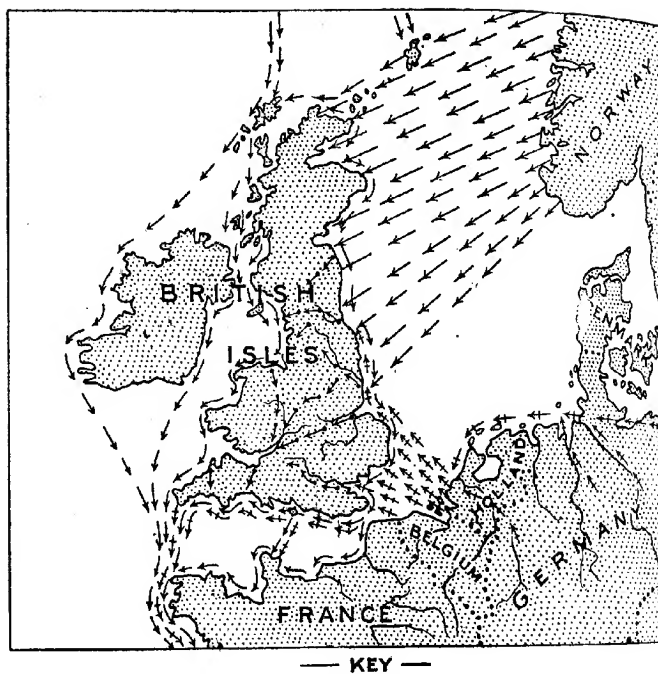
Bird Migrations.—A closer examination is made in this paper of the initial outbreaks of foot-and-mouth disease for the last 22 years in connection with bird migration, and particularly the migrations of those birds which frequent pastureland, as these are the most likely to carry the virus of the disease, if it can be so carried.

Foot-and-mouth disease occurs very little in the countries north of Denmark, and if birds bring it to England from the Continent, they must come from countries to the east, south-east and south. One would expect therefore, to find most of the outbreaks in the south-east part of England. This is actually so; for if a line is drawn from the Wash to the Bristol Channel, it will be found that in the district north and west there have been 27 initial outbreaks, and in the district south

* Miss Garnett is almost entirely responsible for the work relating to bird movements in particular.



Map 1.—Showing Initial Outbreaks of Foot-and-Mouth Disease during 22 years (1900-1921).



MAP 2.—Diagrammatic Map of Bird Migration Routes (Autumn).

and east 52, or nearly twice as many. Of these 52, 36 have occurred east of a line drawn north and south through the Isle of Wight.

There are two great tides of bird migration which flow through these islands; (a) the well-known movement roughly from north and north-east to south in autumn and back in spring, and (b) the less known, but not less important movement from east to west in autumn and west to east in spring.

In the autumn migration on the "north and south route" great numbers of birds arrive on our north-east coast from Scandinavia to continue their journey southwards, and birds from Iceland, Greenland, and northern Europe, pass down both the east and west coasts. This migration need not be taken into account, because the birds following these lines do not come from countries frequently infected.

There remain, then, two regular annual migrations of birds from the south and east:—

(1) The spring migration from the south of birds returning to summer quarters in the British Isles, or passing through on their way further north. This movement begins about mid-February and lasts through March, April, May and sometimes even into June.

(2) The "east to west" autumn migration, when immense numbers of birds arrive on our east and south-east coasts after crossing the North Sea from the shores of Belgium and Holland. This migration starts in mid-September, and lasts throughout October and the first half of November. It may, however, start again any time during the winter when there is severe weather on the Continent of Europe.

The following Table shows the total number of initial outbreaks of foot-and-mouth disease for each month of the year over the whole period 1900-1921, and also the number of years during the same period in which outbreaks have occurred in each month.

TABLE I.

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Number of Outbreaks..	14	5	4	4	2	2	9	3	8	8	8	12
Number of years in which outbreaks have occurred	4	4	4	4	1 or 2*	2	5	3	6	5	6	6

* 1 doubtful case.

The second set of figures shows pretty clearly in which months the outbreaks are of most *regular* occurrence, and serves as a useful check on the first set, though the first set

would be influenced more or less by the opportunities for infection of a large or small number of birds.

From this Table it is clear that by far the greater number (rather more than 64 per cent.) of initial outbreaks have occurred in the months from September to January; that is in the months when birds are coming to England by the "east to west" route, either on normal migration, or (in December and January) owing to hard weather on the Continent. The incidence is also annually high in these months.

From February to May, the months of the spring migration, there are far fewer initial outbreaks, and they are of less regular occurrence than in autumn and winter.

The three summer months, June, July and August, are of peculiar interest because of the large number of outbreaks in July. Migration during the summer is not altogether at a standstill; belated spring migrants are still passing north in June, and in July and August there is probably a little east to west migration. Until, however, more is known definitely of the movements of birds at this season, it is difficult to say whether they can account satisfactorily for the *number and regularity of these outbreaks* in July, and the incidence in this month must for the present be accepted as unfavourable to the theory of birds as carriers of infection over long distances.

So far as can be seen from a contour map, however, the localities of the outbreaks of foot-and-mouth disease favour, on the whole, the idea that the virus may have been introduced by birds. The majority are not exactly on the coast; but migrants, on arrival, unless very exhausted, usually fly inland for some distance before alighting; and many of the more inland outbreaks are in river valleys, which are always great highways for birds. Even when there is an isolated outbreak well into the country (like that near Ripon on 16th July, 1910) there is always the possibility that just before and after that date the bird or birds did not alight in any place where they could have come in contact with cattle, etc., or that cattle did not pick up the virus although deposited.

A striking feature about the outbreaks on the coast is that, unlike those more inland, most of them are near towns of some size. For instance, out of 10 outbreaks on the coast in Kent, 2 are near Rye, 2 near Folkestone, 1 near Hastings, 1 near Deal and 1 near Margate. There is probably some reason for this, and so far as birds are concerned, the most likely explanation is that these outbreaks have been caused

by gulls, which are attracted to places where fishing goes on by the offal that is thrown out.

Species of Birds likely to be Carriers.—Before going into more detail with regard to the individual outbreaks, it will be useful to review briefly the birds which, from their habits, would be most likely to carry and spread the disease. These must be mainly birds which (a) frequent pasture fields, and (b) are migrants, coming to this country from places to the east and south (infected countries), especially birds using the "east and west" route in autumn and winter.

Immense numbers of **ROOKS** (*Corvus frugilegus*), **JACKDAWS** (*Coloeus monedula*), **STARLINGS** (*Sturnus vulgaris*) and **SKYLARKS** (*Alauda arvensis*) come in from central Europe in autumn, travelling from east to west across northern Continental Europe, and down the river valleys to the coasts of Belgium and Holland, whence they cross the North Sea to our east and south-east coasts. In spring, birds of the same species which have wintered in southern Europe, arrive on the south coast, and also on the east coast between Kent and Norfolk. All these birds frequent pastureland. Starlings in particular delight in feeding close to animals at pasture. They are also attracted to feeding troughs in winter.

WAGTAILS, particularly **PIED WAGTAILS** (*Motacilla alba lugubris*), are also fond of feeding near animals at pasture, probably to pick up the insects they disturb in the grass. These birds do not use the east and west route, but **Yellow** (*Motacilla flava*), **White** (*Motacilla alba alba*) and some **Pied Wagtails** come in from the south in spring.

There are a few records of **HERONS** arriving on the east coast in September, and they are birds which sometimes frequent marshy pastures and those bordering rivers and ponds.

GEESSE come in autumn from the far north (which is not infected), but some which have wintered on the Continent pass through in spring on their return journey north, and both geese and ducks come in great numbers to the east coast in hard winters, when the marshes of the Baltic and the Holland coast are frozen. The grey geese feed regularly in the fields and marshes at night, but usually near enough to the sea or to some estuary to return there to rest during the day.

Of **DUCKS** the **Mallard** (*Anas platyrhynchos*) (Wild Duck) and **Teal** (*Anas crecca*) are perhaps the most likely to come in contact with cattle. Most of the mallard wintering in this country come from the north in autumn, but in hard winters

many come from the east and south-east also. At that time of year they often spend the day in large flocks on the sea, or on mud flats, or sheets of open water, fighting in at night to feed in the marshes and fields.

Some of our teal (as well as some mallard) winter on the Continent, and might bring the disease back with them in spring. They would only be likely to affect cattle in marshy fields or near drinking pools. Several initial outbreaks have arisen on such pastures.

A great many WOODPIGEONS (*Columba palumbus*) come to this country by the east and west route. They do not regularly feed in pasture lands, but may visit the feeding troughs.

There are three common WADERS which frequent pasture fields in large flocks. The Lapwing (*Vanellus vanellus*) (Peewit or Green Plover) and the Golden Plover (*Charadrius apricarius*) are found both inland and on the coast, the former being extremely common and the latter fairly well distributed in winter. Immense numbers of lapwings, as well as a few golden plovers, come here by the "east to west" route in autumn and winter. These birds might also bring the disease when migrating north in spring.

The third wader, the Curlew (*Numenius arquata*), is much more of a shore bird in winter than the other two, especially in cold weather, though many resort to inland pastures to feed or to rest at high tide. Some curlews come in by the "east to west" route, and birds wintering further south pass through England in spring, when they go inland to their nesting places, and they also follow some of the overland migration routes on their way further north.

The Redshank (*Tringa totanus*) and Common Snipe (*Capella gallinago*) ought perhaps to be included in the list of waders: both, though present in England all the year round, are migratory to some extent, and both are fond of marshy pastures.

There are other waders, some of them typical shore birds, which might bring the disease when migrating overland or along our coasts, especially when they return northwards in spring and early summer; but none are of great importance in the present connection, though it is possible that even rare visitors (or vagrants) might cause isolated cases.

GULLS are especially interesting because of the large numbers of immature and non-breeding birds which have nothing to prevent them from wandering about at all seasons. Of the five common kinds, four—the Greater Black-backed Gull (*Larus*

marinus), Lesser Black-backed Gull (*L. fuscus*), Herring Gull (*L. argentatus*), and Common Gull (*L. canus*)—take from three to five years to become adult, and the Black-headed Gull (*L. ridibundus*) does not usually breed until two years old. These gulls vary individually in numbers at different places and different seasons, and except the great black-backed, are by no means confined to the coast. The two smaller kinds (black-headed gull and common gull) feed to a large extent on earth-worms and grubs, following the plough or getting them from pasture fields. All gulls are, however, omnivorous, fishing when inland in rivers and ponds and feeding on garbage heaps. Several initial outbreaks have arisen near garbage heaps from slaughterhouses and fish factories. Gulls often rest in pasture fields even when not feeding there.

Not much is known definitely about the migrations of gulls. There is a general movement south in autumn, and north in spring. During the herring season on the Norfolk coast (i.e. in autumn), large numbers of great black-backed gulls and herring gulls congregate there, and it is almost certain that some immigration of gulls takes place at that time from the coasts of Holland and Belgium.

Besides these regular migrations, gulls are often on the move; when going from place to place they prefer to fly against the wind, and it is impossible to say how far they may go in search of food. The summer wanderings of immature and non-breeding birds might possibly account for some of the July outbreaks, which occur when there is practically no regular migration.

A closer analysis of the migratory movements of birds in relation to the seasonal and local incidence of the outbreaks of invasion (initial) is attempted in the following paragraphs.

Spring Migration (see Map 3, February, March, April and May).—Birds returning in spring to the British Isles to breed, or on their way further north, either cross the Channel direct to the south coast, and make their way north by inland routes, or follow up the east and west coasts. Many of them pass inland up the river valleys on their way to their nesting places. Those which have come up the west coast of Europe and are bound for Scandinavia and northern Europe, may cross the Channel via the Scilly Isles and then continue north-eastwards along the south coast of England, or turn northwards up the west coast for some distance before crossing over to the east by

one or other of the overland routes. The general tendency at this season is from west to east over England as well as from south to north.

This migration does not start till mid-February (W. Eagle Clarke gives 11th February as the earliest date for arrivals on the south coast). The February outbreaks are all early in the month. This, however, would not necessarily exclude birds as carriers since earlier movements might take place at the tail-end of winter, and as weather movements. Nevertheless, it would be very curious if the weather migrants carried the disease in early February and the regular migrants did not do so later in the month, but neither spring immigration nor spring invasions are to be regarded as confined to February: the incidence is high in March and April, only falling in May and June.

It must be borne in mind that all the dates here mentioned, and those on the maps, are the dates of the actual appearance of the disease, and that from 5 to 10 days or more must be allowed for the virus to be picked up and for the period of incubation in the animal. This might easily take early February outbreaks back to January and winter movements, and so on for other dates.

South of the Wash there are March outbreaks in Kent and Surrey, April ones in Kent, Essex and Norfolk, and one May outbreak in Norfolk. These might be accounted for by the south to north migration of birds which have come directly across the Channel to the south coast; or the outbreaks in Kent, Essex and Surrey might equally have been caused by birds which had entered the country by way of the Thames estuary.

Either way the absence of outbreaks in the west of England and in South Wales is noteworthy, and if it means anything, points to infection having come from south-east rather than from due south. The idea that this may indeed be so receives some support from the fact that, according to W. Eagle Clarke (*Studies in Bird Migration*), "during late February, throughout March, and sometimes the first half of April, considerable numbers of rooks, occasionally accompanied by daws, starlings and skylarks arrive during the day-time on the south-east coast of England between Kent and Norfolk." These birds arrive from the east and south, and must be almost the only birds following the east and west route in *that direction* in spring.

The March outbreak in Yorkshire might have been due to birds which had come up the east coast and followed up the river valleys from the mouth of the Humber.

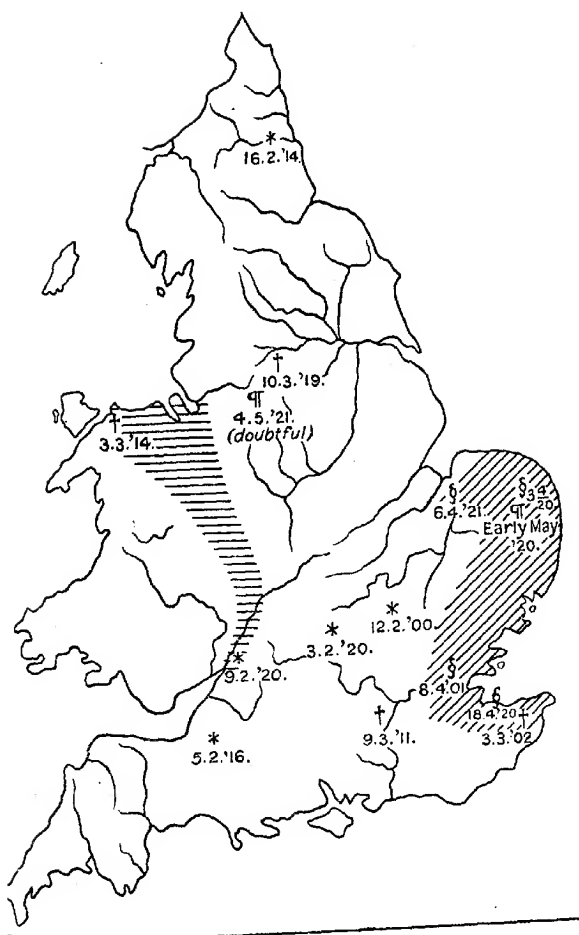
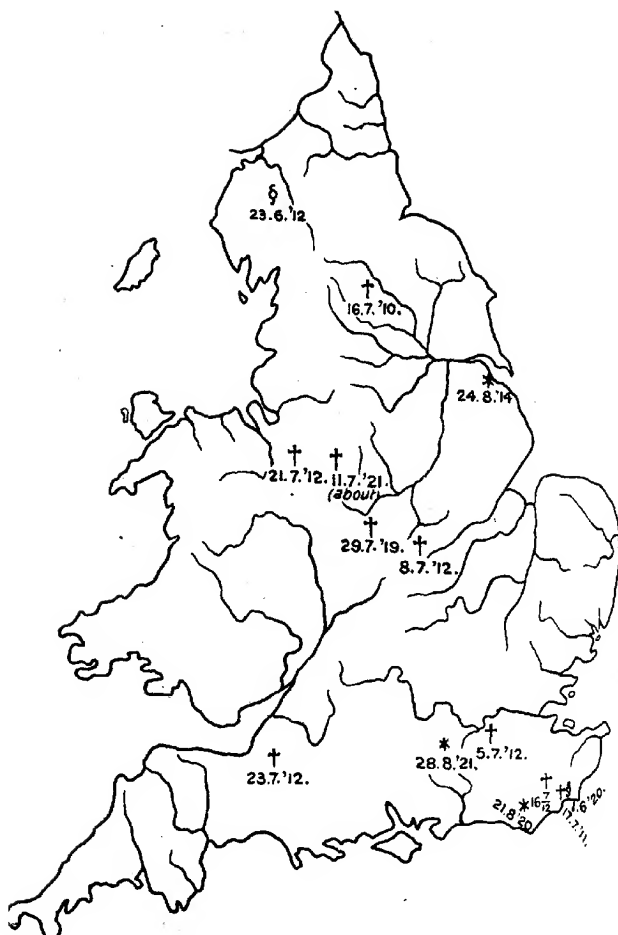


Fig. 3.—Distribution of Outbreaks of Foot-and-Mouth Disease in February, March, April and May.
 The oblique shading indicates roughly the area most affected by immigration of Books, etc., on East Coast at this season.
 The horizontal shading shows the route followed by Gulls from the Severn to North Wales & Lancashire.



MAP 4. —Distribution of Outbreaks of Foot-and-Mouth Disease in June, July and August.

The March outbreak in North Wales would not appear very difficult to account for at first glance on the theory of birds being carriers. There is a well-known migration of gulls in autumn from the Dee estuary across the Ellesmere district of Shropshire and down the Severn valley to the Bristol Channel, and in spring there is a rather less marked return movement north along this route, some of the birds crossing the hills of north-east Wales, which would bring them out in the Rhyl and Conway valleys. This route is followed by black-headed, herring, and lesser black-backed gulls, and except for the first they do not often alight on the way. The March outbreak (Denbigh) would fit in well with this spring movement.* There have, however, been two other outbreaks along the same coast, neither of them anywhere near the time of the spring migration. These will be referred to later.

Summer Migration (Map 4, June, July and August).—In June some birds on passage to the north continue to cross our shores; and in July a few waders certainly arrive, mostly non-breeding birds and those that have finished nesting early. Some of these have probably come to us from the south-east (e.g. Ruffs in Kent). Most of the birds of which records are to be found, however, are of the rarer kinds, and as the July outbreaks have been, comparatively speaking, numerous, and have occurred in five different years, which shows them to be almost as regular as the winter ones, fortuitous migrants can hardly be accepted as having introduced the virus in July.

There are a few birds which from their habits are to some extent open to suspicion, though there is little or no positive evidence of their coming from the Continent at this season.

Young starlings, both here and on the Continent, flock together and begin to move about as soon as they are fledged (i.e. about the middle of June). From 20th June onwards great numbers migrate from east to west across Heligoland, and there is some evidence that they have once or twice arrived on the east coast of England about the end of the month. It would seem, however, very exceptional for this migration to reach our shores.

Some lapwings are in flocks as early as the middle of June, and the fact that our own breeding birds are moving down to the coast and sometimes visiting outlying islands and lightships

* Given outbreaks in England in the northern or southern limits of this track, infection might be conveyed from north to south or vice versa. It is a fact that outbreaks on the Lancashire coast have been followed by others of quite obscure origin on the south-west coast.

in late June and in July, makes it possible that some immigration might take place without attracting notice.

Young herons (*Ardea cinerea*) on the Continent have been known to make very long journeys before the end of June; and while but little is known definitely of their migrations it is certain that there is a little immigration by the east and west route in autumn; as with the lapwings, the arrival of a few in late summer would be difficult to observe, because the home-bred birds frequent the shore at that season.

If birds have carried the virus for these July outbreaks, movement of gulls would also be a possible explanation. There are always a lot of young and some old, non-breeding birds round the coast in summer; they wander inland almost anywhere, following up the river valleys, visiting ponds and reservoirs, and any fields where they can find food. Their numbers might easily be increased by arrivals from the Continent without attracting notice, especially in summer when our own breeding birds are beginning to move about.

The distribution of these outbreaks particularly arouses curiosity; 5 out of 9 in July are north of the Wash to Severn line, while in all the other months the majority of the outbreaks are south of that line.

In most of the cases north of the Wash, it looks as if the disease had been brought up the Humber and dispersed along its tributaries into the surrounding country, or else had been brought in by the Wash and carried across England in a north-westerly direction; this might also apply to the outbreak in Cumberland in June, 1912. The July outbreaks south of the Wash might have been caused by birds which had entered either by the south coast or up the Thames valley.

The outbreaks on the coast in Kent near Rye in July, 1920, and June, 1911, by their position close to a fishing town, at once suggest gulls, possibly from the northern coast of France.

Autumn Migration (Map 5, September, October, November).—In autumn, besides the birds which stream down our coasts from the north, and those which cross the North Sea from Scandinavia and arrive on the east coast of Scotland and the north-east coast of England (these come from clean countries), an immense number comes to us from the east and south-east across the southern portion of the North Sea.

The centre of this immigration (from east and south-east) is on the Essex coast and the mouth of the Thames, and it extends from Dungeness in Kent as far north as Lincolnshire. The direction from which the birds come is due east on the

Essex coast and mouth of the Thames, and south-east in Norfolk and Lincolnshire, where, from their line of flight, they are thought to have crossed the North Sea from the estuaries of the Maas, Scheldt and Rhine, down which rivers they have travelled on their way from central Europe.

From the north coast of Norfolk many birds turn south-west and cross England from the Wash towards the Bristol Channel; others continue to "skirt the coast northwards (which they—the skylarks and grey crows in particular—sometimes do as far as the Tees) proceeding inland at various points as they go. Those forming the left wing, and they are a considerable contingent, pass westward along our Channel shores to reach winter quarters in southern and south-western England and in Ireland, while others doubtless cross towards the shores of France en route for more southern lands."*

The regular autumn migration lasts from September to mid-November, and all the initial foot-and-mouth outbreaks during this time occur in areas which could be affected by the migration. A few of the September outbreaks are rather early for this regular migration, but there is no doubt that some birds arrive in this country from the east as early as August.

The isolated series of outbreaks in Northumberland, Lancashire and North Wales in September, 1912, is interesting, and at the same time puzzling. For one thing they are much further north than any others at that season. Again, there have been three initial outbreaks altogether on the north coast of Wales in 22 years—these constitute the only outbreaks up to date which have arisen on the west coast—and there is a curious coincidence between these and the initial outbreaks in Northumberland, viz. :—

1912. N. Wales—1st Sept. Northumberland—9th Sept. South Lancs.—1st Sept.

1914. N. Wales—3rd Mar. Northumberland—16th Feb.

1920. N. Wales—22nd Jan. Northumberland—18th Jan. North Lancs.—20th Jan.

The Lancashire outbreaks in 1912 and 1920 seem partly to link up the two places. Whether there is really any connection, however, is a matter for speculation; there is certainly migration overland between the north-east and north-west coasts which might account for it, but one would not expect to find birds moving north-east in September or south-west in February-March. There is, however, so long an interval between the latter (16th February—3rd March, 1914) series of

* W. Eagle Clarke, *Studies in Bird Migration*.

outbreaks that they are less likely at least than the others to be connected.

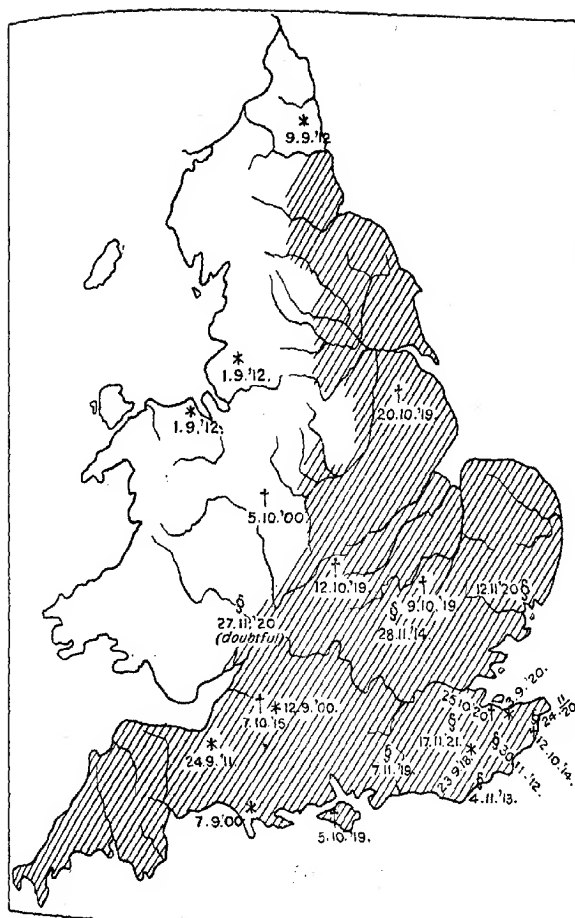
Winter Migrations (Map 6, December, January and February).—After the middle of November the regular autumn migration ceases, but nearly every winter there are spells of hard weather when birds from the Continent are driven to seek refuge in the British Isles, where, especially in the west, the climate is milder.

Many of these birds come by the "east and west" route, their migrations sometimes lasting for days if the weather continues severe, and at such times swarms of birds including rooks, larks, lapwings and great numbers of wildfowl arrive on our east and south-east coasts, most of them travelling westward through southern England, or along the south coast, or crossing to Ireland.

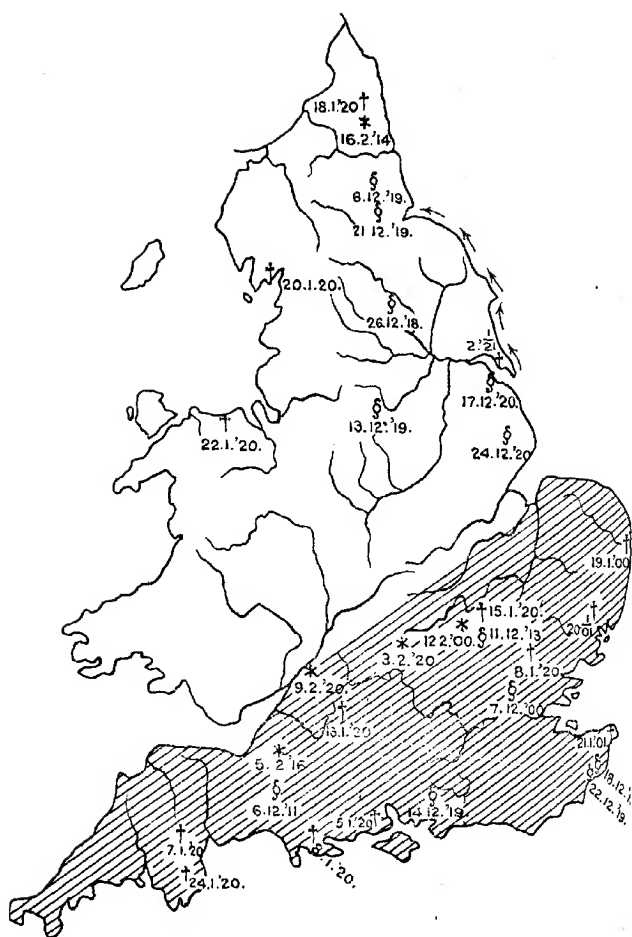
These forced migrations in search of food and shelter may occur at any time between November and March, but the chief months are December and January, which are also months when the number of outbreaks of foot-and-mouth disease is high.

Any of the outbreaks south of the Wash, and after the regular autumn migration season, might have been caused by birds on these weather movements, but there have also been 11 north of the Wash where the "east to west" migrations apparently do not extend at this season.

There is a curious movement of gulls, however, on the north-east in winter, when, during strong north or north-east winds between October and January, great numbers of common gulls, herring gulls and lesser black-headed gulls fly along the shore or over the sea, heading north or north-west against the wind. This movement is observed in Yorkshire from Spurn Point to the Cleveland coast, and opinions differ as to whether it is true migration or only due to the gull habit of flying up wind (not nearly so many gulls return south, however, when the wind changes to south-west). Either way it is possible that birds from the Continent may form some part of the movement, especially as north-east winds in winter often coincide with very cold weather. In Yorkshire during the north-east wind the gulls only fly past over the sea, but there seems to be no mention of them passing up the Northumberland coast, and as the movement depends on wind, it must be of uncertain duration, and it would account for the presence of gulls from the



MAP 5.—Distribution of Outbreaks of Foot-and-Mouth Disease in September, October and November.
The shading indicates roughly the area affected by "East and West" migration at this season.



MAP 6.—Distribution of Outbreaks of Foot-and-Mouth Disease in December, January and February.
Shading indicates roughly the area chiefly affected by "East and West" migration at this season.

The arrows on the N.E. Coast show the course of Gull movements during N. and N.E. winds.

south on the north-east coast at that season. Once there they might wander anywhere inland in search of food.

These winter movements do not, of course, occur with the regularity of the autumn and spring migrations, and yet there have been more outbreaks of foot-and-mouth disease in December, January and February than in September, October and November. If, therefore, the disease has been brought by birds in these out periods, some further explanation seems necessary. It might depend, however, upon the habits of birds varying with the seasons, as they do. For instance, some which feed in stubble fields in autumn take to the pastures in winter, and so would be more likely in that season, if infective at the time, to infect animals at pasture.

Conclusion.—In conclusion there would appear to be most remarkable relations, both as regards seasons and localities, between the movements of birds and the initial outbreaks of invasion in foot-and-mouth disease in Great Britain. Some of these outbreaks, however, do not correspond with what are believed to be the known facts as regards bird movement. On the other hand, these facts are admittedly incomplete, and the circumstantial evidence as a whole is very far short of being able to establish a negative.

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IMPERIAL ECONOMIC CONFERENCE, 1923: IMPORTATION OF LIVE STOCK.

At a meeting of the Imperial Economic Conference which was held on 26th October, the question of the Importation of Live Stock was discussed. Those present included :—

The Right Hon. Sir Philip Lloyd Greame, K.B.E., M.C., M.P., President of the Board of Trade. (In the Chair.)

His Grace the Duke of Devonshire, K.G., G.C.M.G., G.C.V.O., Secretary of State for the Colonies.

The Right Hon. L. S. Amery, M.P., First Lord of the Admiralty.

Lieut.-Col. The Hon. Walter Guinness, D.S.O., T.D., M.P., Financial Secretary to the Treasury.

The Right Hon. Sir Robert Sanders, Bart., M.P., Minister of Agriculture and Fisheries.

Lieut.-Col. A. Buckley, D.S.O., M.P., Parliamentary Secretary to the Department of Overseas Trade.

The Right Hon. W. L. Mackenzie King, C.M.G., Prime Minister of Canada.

The Hon. George P. Graham, M.P., LL.D., Minister of Railways and Canals, Canada.

The Right Hon. S. M. Bruce, M.C., Prime Minister of the Commonwealth of Australia.

The Right Hon. W. F. Massey, Prime Minister of New Zealand.

The Hon. Sir James Allen, K.C.B., High Commissioner for New Zealand.

The Hon. H. Burton, K.C., Minister of Finance, Union of South Africa.

Mr. C. A. Innes, C.S.I., C.I.E., Member of the Governor-General's Council for Commerce and Railways, India.

Mr. Dadiba Dalal, C.I.E., High Commissioner for India.

The Hon. W. G. A. Ormsby-Gore, M.P., Parliamentary Under Secretary of State for the Colonies.

The Chairman suggested that the Conference would probably wish the Minister of Agriculture to open the discussion. and Sir Robert Sanders thereupon addressed the Conference.

Sir Robert Sanders: I do not want to go at too great length into the history of what has been a somewhat contentious subject. The position was until a year ago that all live cattle

were prevented from coming into these islands and it is under that system that the present generation of agriculturists have carried on their business. That was called the "embargo" and that was imposed by the "Diseases of Animals Act, 1896." I am quite aware that great objection is taken particularly to the name of that Act, an objection which I have heard expressed on several occasions with vehemence, I might almost say with heat. That is really one of the eccentricities of English jurisprudence. We have a large number of Acts of Parliament called by curious names. For instance, we have an Act that says that contracts for the sale of land must be in writing. We call that the Statute of Frauds. There was an Act passed in 1909 under which Local Authorities prohibit Cinema Exhibitions from taking place on Sunday, and censor films that might be calculated to shock the youthful visitor. Well, we call that an Act "to make better provision for securing safety at Cinematograph Exhibitions." Those are the sort of eccentricities that you get in Acts of Parliament. It is rather the rule than the exception that a state of things should arise under an Act of Parliament that has nothing to do with the name of that Act. Now, the next step in this matter is that in consequence of promises made by Lord Ernle in 1917 to Canadian representatives, this subject was brought up in both Houses of Parliament in the summer of 1922, when the following Resolutions were passed:—

In the House of Commons:—

"That this House is of opinion that the time has arrived when the embargo on the import of Canadian Cattle should be removed."

And in the House of Lords:—

"That this House accepts the conclusions of the Royal Commission that the Dominion of Canada is free from cattle plague, pleuro-pneumonia and foot-and-mouth disease and is of opinion that steers from the Dominions might be admitted as store cattle to Great Britain, subject to precautions by means of quarantine being taken."

In consequence of these resolutions, an Act was passed last December entitled the "Importation of Animals Act, 1922." That Act authorises the admission of store cattle from Canada. So far as Canada is concerned, we have withdrawn unreservedly any suggestion that her cattle should be excluded on grounds of disease. The stigma to which she objected, which was imposed by the Diseases of Animals Act, has been removed by the

Importation of Animals Act of last year. I understand, however, that Canada is not completely satisfied and that she desires not only free import for her store cattle as defined in the Act, but also free access to our inland markets for her fat cattle. With regard to this request, I must point out that the British Government must have regard primarily to the interests of its own producers. I think that principle has been admitted more than once during this Economic Conference. Canada has been accustomed for the last generation to send us her fat cattle for slaughter at the ports. It is still open to her to do so. The removal of the embargo on store cattle does not justify a claim that additional privileges should be given to fat cattle, if, as most certainly is the case, the representatives of British agriculture are convinced that it would be detrimental to their interests. This definition of store cattle was inserted in the Act by the House of Commons without any pressure from the Government. It is not embodied in a Diseases of Animals Act, so that it casts no stigma on the health of Canadian cattle, whether store or fat, and it must be regarded as a matter of domestic policy adopted in the interests of our own producers. I cannot hold out any hope, therefore, that the Government will propose or that Parliament would accept any alteration of a decision that was deliberately arrived at less than a year ago.

The second clause of the Act authorises the Minister to admit by Order Canadian animals other than stores. Such Order, however, has to be approved by both Houses of Parliament. My predecessor, Sir Arthur Boscawen, had informed the Canadians of his intention to introduce such an Order at an early date and was under the impression that he would be supported by the agricultural interests of the country in doing so. When, however, I came to look into the question I found that that impression was based upon a misapprehension and that all classes of our agricultural community were strongly opposed to admitting breeding cattle into the country. So strong was that opposition that I thought it very unlikely that such an Order would be confirmed by Parliament. Probably it is not generally recognised what an important matter our pedigree herds are to English agriculture. They have been built up mainly by private effort, though latterly the Government has given some assistance, and although they comprise only a small proportion of the total stock of cattle in the country they influence the quality of a vast number of animals that are not pedigree. Our agriculturists are exceedingly nervous

about anything that would in any way reduce the class of our stock which we have done so much of late years to improve and they are firmly opposed to the admission of breeding cattle to this country.

Mr. Massey: You mean stud cattle?

Sir R. Sanders: Yes. It is only right for me to say that this applies to all breeding cattle and that the strong feeling of the great majority of agriculturists is against making any further relaxation of the present system.

So far as the majority of the Dominions are concerned, geographical considerations must limit the importation of cattle from the Empire to Great Britain to valuable animals which will realise a high price. Having regard to the paramount importance of safeguarding the interests of our own breeders and our valuable trade in the export of pedigree stock not only to the Dominions but also to foreign countries, the British Government, while anxious to promote inter-Imperial trade and to give the best possible terms to the Dominions, would not feel justified in doing more than to undertake to introduce legislation to facilitate the exchange of pedigree stock throughout the Empire as a whole on reciprocal terms, subject always to satisfactory precautions being taken against the introduction of disease.

Mr. Graham: Mr. President, I am not sure just why a question of this kind should be brought before the Economic Conference unless it be to provide a jury at the trial of this question. This matter was thrashed out for a great many years, Canada strongly objecting that the reason given for shutting out her cattle that they were diseased was not founded on fact, and full investigation has proved the truth of the contention. There was no reason in our mind to exclude Canadian cattle for very many years under the Animals Diseases Act. Now, it has been stated that it is an eccentricity, I might call it, of British jurisprudence, that you often call things by their improper names in the title of Statutes, as the question of protecting children in the cinemas, etc. Well, in that case, there was no stigma placed on cinema men, the Act was careful in its title—true to make it mean something it did not mean—but it was careful not to place any stigma on the business of the cinema men. But in this case for many years we have suffered under the allegation that cattle disease was rampant in Canada, which was not the case. I might add just here that,

although in a measure the embargo has been lifted, portions of our cattle under the enforcement of regulations are still suffering from the stigma, because when an inspector, in classifying the cattle landed declares that any cattle come under what might be called the "fat class," they are slaughtered on the dock as if they were diseased cattle under the Animals Diseases Act. There is no pretension by anybody that there is any disease in the cattle, they are not slaughtered because they are diseased, but are slaughtered because they are considered not to come under the technical stocker class. We think that is an incongruity and an injustice.

To come down to 1922, I must say with brutal frankness that the Canadian people are very much disappointed. After arriving at an agreement with the British Government along certain lines, we are disappointed to find out that the Statute passed did not comply with the terms of the understanding. There was a restriction defining "store" or "stocker" cattle placed in the Act which was not considered, I believe, at the Conference between the Finance Minister of Canada, the Minister of Marine and Fisheries, and the British Government. It has been stated that that was introduced by a private Member, and while I do not wish to criticise it, as that is the business of the British Government, I am inclined to think that, if the Government had resisted the amendment, it would not have been pressed, much less passed; but that is the business of the British Government.

Now I pass on to the present difficulty, because, if the Act had been passed as was discussed at the Conference, it would have left the door much wider open. I admit that there are difficulties in passing Statutes, in enacting Statutes in Parliament, perhaps on the inside that may not be discernible on the outside. I have had experience along that line myself. We have arrived at this stage. We do think that the Act, or that portion of the Act providing for the admission of breeding cattle or cattle capable of breeding should be made operative. It must have been so intended, else it would not have been placed in the Statute, and we feel that, while we cannot press it further, it is a fact that the British Government is not complying entirely with the understanding arrived at between the two Governments.

A matter that has not been mentioned is this. Provision has been made now for classification as between stockers and fat cattle and we contend that that was not anticipated in the Con-

ference. But even under the Statute as passed which contained the new restrictive clauses this inspection has been carried on not only with a detrimental effect to the Canadian cattle trade but with an injustice to the Canadian cattle trade. Stockers have to comply with certain restrictions—branding, detention and that kind of thing—to which fat cattle are not subjected. Then stockers have to be kept separate from fat cattle, and there are various restrictions to which what we call fat cattle are not subject. These cattle that are shipped as stockers from Canada arrive at the port in Great Britain, and it is our contention, we think based upon fact, that the spirit of the Act, the spirit of the arrangement is not being carried out but is being nullified by the details of the inspection. In other words, that cattle that are really stockers or store cattle and capable of being fed for weeks and months with great improvement are placed in the category of fat cattle when they arrive here, and are not even allowed to be taken a few hundred yards to another abattoir, but are slaughtered on the docks. They are slaughtered under the Animals Diseases Act though they are not diseased, with great detriment to the reputation of Canadian cattle. Further, these animals which we contend are not fat, are slaughtered and their carcasses must be sold. Canadian meat of an inferior quality is thus placed on the market. It is not fed up to the point of superiority of which it is capable, and Canadian beef is put down as an inferior article because the cattle are called fat by an inspector and slaughtered that neither we in Canada nor you in Great Britain would under any other circumstances think of slaughtering for the market. It is not out of place for me to give a detail or two. Several head of cattle were sent over here a few days ago by the Canadian Government as store cattle, cattle that in our country would be considered stockers, cattle that I have no hesitation in saying your farmers would call stockers if they owned them, and would feed them at least until the Christmas trade arrived. There were some 60 of these. They were all eventually put down as fat cattle and slaughtered; showing a distinct conflict of opinion between our experts in Canada and the inspectors here. I could give other details.

Another question has been raised which I do not think was ever in the mind of the British Government, and that is. inspectors have undertaken to say not only that cattle are too fat but that others are too poor. Surely that was not the intention that the inspector was to classify an animal as one that

should not be sold to a farmer to fatten if he wanted to buy it. There was in one shipment of cattle carried recently quite a number of exceptionally poor cattle. I had hoped to have had the photographs of them here to-day, but they have not arrived. These cattle were not considered too fat. They were considered too poor and not of the proper class of cattle for the British farmer to fatten. That surely is an intervention with trade not contemplated in the Act. To my mind under that Statute the inspector would have just as much right to inspect a horse of mine that I was selling over here and to say it was not fit for the market. The idea and the whole intention of the Act was that cattle should come over here to be fatted, and the class of animal would be a thing between the farmer here and the seller in Canada. I only mention that to show to what extent the inspection goes.

I do not know that I need go into any more details. We are thoroughly disappointed. I could read much stronger language than I would think proper to use, but we feel that not only are our farmers disappointed after being shut out of the market for 30 years on account of diseases which did not exist but that the agreement made is being disregarded. The door opened, cattle were coming in freely, and were being sold and purchased rapidly by the farmers here for fattening, but all at once, the door is in a measure closed. Now the shutting out of these fat cattle or of cattle that are called fat by inspectors, is of far greater moment than it may appear. It has this result, that the raisers and stock breeders in Canada are beginning to think that there is no use in endeavouring to take advantage any more of this market because they do not know whether an animal will be declared fat when it gets over here or not, and the slaughter of all these animals so declared to be fat animals, but which we contend are not, has always been done not only with loss to the immediate interest but to the detriment of the good name of Canada and the beef which our best cattle produce.

A suggestion was made by the Minister of Agriculture as to an arrangement for the interchange of pedigree stock. Possibly it would be of some benefit, but it will not cure the situation as to the exclusion of our good grade stock which might be capable of breeding. But the immediate trouble, and the greatest disappointment we in Canada have, is the fact that cattle we send over as we believe under the Statute are classified so as to nullify much of the good that should come to our trade under the Statute.

Then we cannot see why we should be used differently from any other Dominion. We would not at all say that any other Dominion should be deprived of anything it has on our account. Not at all. But we believe if trade is to be Imperial the benefits must be reciprocal. It is a fact, so I am informed, and is publicly stated in our Press, in an interview with the *Montreal Gazette* (perhaps one of the sanest newspapers in the British Empire) that Canada's cattle do not receive the same treatment as at least one other Dominion, in that their cattle after certain days of quarantine in England are allowed to be sold anywhere either as stocker or fat cattle. All those restrictions are put against our trade. As I said in the first place I am not sure this should be dealt with at the Conference as it is a matter between the Canadian Government and the British Government.

I have endeavoured to place our side of the case as impassionately as possible before the Conference. We think the spirit of the Act is being nullified by the system of inspection, and that the advantages which were intended to be had for Imperial trade are not being experienced; and as a result of it all, the Canadian farmer feels greatly aggrieved and greatly disappointed in that he is not getting what he was assured he was to get in the way of freedom of entry for his cattle into the British market.

Mr. Bruce: Sir Philip, I have got very little to say with regard to this matter. It is one, of course, which primarily concerns Canada. There is one point, however, I want to draw attention to, and, particularly, in view of the last few words that Mr. Graham uttered. He said he did not see why Canada should be treated differently from other Dominions. It is suggested that, while there may be some questions upon which there is a difference of opinion, Canada is being treated very advantageously as against any other Dominion at the present moment. Really that is the only point that I want to raise, and I do want to utter a protest with regard to it. It is that under the Diseases of Animals Act, 1894, we are excluded from this country, and there is an implied suggestion that there is some disease in Australian cattle. That I absolutely repudiate, and say that there are no possible grounds for any such suggestion. I appreciate all that Sir Robert said at the beginning as to the naming of Acts and so on, but none the less that is a position which I want to utter a protest against. As to the actual question under discussion, we have nothing to say about it, but it is true that it is not a trade with which we are actually

concerned, but we certainly do want to maintain the position which we have taken up very definitely indeed with regard to our own country. It is that we have a perfect right to take whatever action we consider necessary in the interests of our own particular producers. We take a very definite stand on that, and we say that nobody is entitled to try to dictate to us as to what we shall do for the protection of the people who are our own particular producers, and having taken that view, we certainly would not think for one second of attempting to force any other Government to take any action which was against the interests of their own particular producers, and I do not think it is dictated by a feeling of apprehension that we might be weakening our own position. I think we do accept that as a fundamental principle that we are prepared to adhere to, and naturally we could not express any views which could be interpreted as trying to force somebody else to do what we are certainly not prepared to do ourselves.

Mr. Massey: I hardly think that New Zealand is very seriously concerned in the shipment of live stock from that country to Great Britain. I do not think anything of the sort is possible; the voyage is too long. Of course, in saying that it is well to admit that stud stock are occasionally carried from England to New Zealand and a few the other way. Every year a certain number of horses and cattle are shipped and I suppose that will continue.

Sir Robert Sanders: The trade in horses is perfectly free.

Mr. Massey: I am glad to hear that. I just want to emphasize the point which has been referred to by the Prime Minister of Australia. So far as disease is concerned we have practically none. I want to qualify that by saying that I believe we have probably the same proportion of tuberculosis in our cattle as will be found in every other country in the world. There is no country that I know of free from tuberculosis, but in stock we have no such thing as foot-and-mouth disease, and I know you have had it here pretty often. We have no anthrax; I have heard of that in the United Kingdom. I am glad to think that measures have been taken to stamp them both out. So far as I know, neither of those diseases is prevalent in England at present. Horses are not affected by what is proposed, but I want to raise this point. You have a big exhibition coming on here next year which I hope will be a tremendous success, and, if so, I believe it will do every

country in the Empire a great deal of good. What are you going to do with regard to stock coming over for that exhibition?

Sir Robert Sanders: There is a clause in the Act of 1896 by which the Board may make such Orders as they think fit for allowing the importation of foreign animals for exhibition purposes.

Mr. Massey: Will there be permission to dispose of them in this country? I may say I was consulted about this before I left New Zealand, and the opinion I expressed was simply that I hardly thought either cattle or horses would be sent to England for exhibition purposes. New Zealand is one of the countries where stud stock does not deteriorate. I believe we could with advantage send over some sheep that would be an object lesson to Britain. I am speaking of the breed peculiar to New Zealand—Corridales. They have spread very rapidly all over the Dominion and they are useful both for mutton and for wool. I should like to know something definite about it. I do not say our people do not want to send horses. I only say that, in my opinion, it would not be worth while. You have had very good horses imported from New Zealand before to-day. I would like to know what is going to be done definitely with regard to the animals coming from overseas for the exhibition, whether they would be allowed to be disposed of here, because it would be of no use bringing stock here and intending to take them back. Very few people could stand the expense and I would not be inclined to encourage it.

Sir Robert Sanders: They would be in very small numbers.

The Chairman: The exhibition would not hold a great lot of them.

Mr. Massey: I presume each country finds room for its own exhibits.

The Duke of Devonshire: I am not speaking as Colonial Secretary now, but as connected with the British Empire Exhibition. If you send the stock and it is allowed to come, by the Sanitary and Local Authorities of Wembley, who may have to be consulted in the matter, I will undertake to say that you will be able to get rid of it to the best advantage you can.

Mr. Massey: That is something definite and I am very glad to get that. It would not be satisfactory if I could not tell my people something definite when I go back. There is another point. I am raising this in the interests of British

agriculturists as well as my fellow citizens. If they want to benefit themselves let them look at the fact that South America is gradually taking possession of the whole beef market in Britain. That is the position to-day. I can only speak from memory, but I believe that last year 5,000,000 quarters of beef came into this country from South America, and I know perfectly well that the British farmer cannot produce fat stock—I am speaking of cattle—anything like so cheaply as the man in the Argentine can, or one of the other States there, and send it to England.

I am interested, of course, as representing a great producing country, but I think the interests of the British agriculturists come even before those of the New Zealand farmer and are very much more seriously affected. I am not worrying about lamb and mutton. We can beat them in lamb and mutton every time, but we simply cannot stand up to them with beef. I have advised New Zealand to drop the shipment of beef and go in for something else. I do not know that I have anything more to say. I am very glad to have this statement from the Duke of Devonshire with regard to the exhibition of stock which New Zealand is inclined to send.

Mr. Burton: This seems to me to be really a matter for settlement between the Dominion concerned and the British Government more than for this Conference. I have nothing to say about that, but I should just like to say that I welcome the statement made by Sir Robert Sanders with regard to the promise to facilitate this exchange of pedigree stock. As far as I am aware that would be of considerable value to South Africa and I look at it from that point of view.

Mr. Riordan: As the statement made by Sir Robert Sanders in no way affects the interests of the Irish cattle trade, I shall not delay the Conference with any further remarks.

Mr. Mackenzie King: In the first place, I would like to mention again what I said at the opening meeting, that we appreciated in Canada the difficulties with which the British Government were confronted in this matter and appreciated sincerely the action of the Government in seeing that the embargo was removed, giving admission to our cattle. We wished to do something more than give verbal appreciation of that action, and we increased the British preference, amongst other things, in the hope that the British public would realise that having met us in a matter in which we were vitally concerned

we, in like measure, would like to meet them in a matter which was of concern to British interests. We increased our preference by giving an additional 10 per cent. discount on the existing preferential duties on all goods coming through Canadian Ports. I want to make it clear that this was done largely as the result of the action of the British Government in respect to the admission of our cattle. We intend to hold to what we have done.

Our attitude in the matter of preference is one of trying to further as much as we can inter-Imperial trade. The point which I think we would stress most strongly—and it is a point, I think, which is felt equally on this side—is the importance of carrying out whatever agreements may be reached in the spirit as well as in the letter. We have no desire to do other than live up to an agreement that we have made, and we expect the British Government to adopt the same attitude, not only by itself and its Ministers, but through its officials. We think the officials should be definitely instructed as to what is the agreement and understanding in this matter. As Mr. Graham has pointed out there was a definite agreement made between the Ministers of the Crown of Canada and the Ministers of the Crown here, as to what was to constitute the provisions of an Act of Parliament. That agreement was altered somewhat by an amendment of the Act. That was a disappointment, but we realised that the Government had its difficulties in a measure of this kind when it came into the House of Commons and the House of Lords.

However, the Act itself stands for the voice of the British Parliament, and at the moment we find a further disappointment in that the Minister of Agriculture tells us distinctly that, though the Act has a clause referring to the admission of breeding cattle, which has been framed with a view to giving practical expression to another phase of the agreement, he will find it impossible to introduce the Order which would give force to that clause of the Act and make it of service to us. That must necessarily occasion another considerable disappointment. It distinctly cuts down the value of the legislation and distinctly limits what we hoped and expected would be the outcome of the agreement.

Now, as to the difficulties, there again let me say that our Government are prepared to be as considerate in every particular of the difficulties with which the British Government is confronted as can reasonably be expected, but there is a limit to which consideration can go. If the Act in its provisions is to

be whittled away clause by clause and what is left to be completely whittled away by the method of administration, of what avail is it? That brings me to the last point, namely, the administration and regulations in regard to the admission of store cattle. As Mr. Graham has pointed out, that is really very serious, because it affects our cattle in two ways. In the first place, it brings back a certain stigma which the Minister has rightly stated was never justified, and which the British Government is anxious to have removed completely, but in the second place it gives to our beef in the British market a reputation which it does not deserve. Indeed, it may conceivably help to destroy the very trade it was intended to further. If we send our cattle in as store cattle, lean and thin, and with the intention of having them fattened here, and they are slaughtered immediately and put on the British market as Canadian beef, it will not take very much in the way of marketing that kind of beef to destroy any reputation our cattle may have. One can see how the farmers of Canada would naturally be very sensitive on a point of that kind. I believe if the Minister of Agriculture will say that in the carrying out of the legislation he will see that instructions are given to his officials to the effect that the spirit of the law must be lived up to, and that Canadian cattle coming in as store cattle must not be put into a classification into which they should not properly be placed, he will go a long way to remove what Mr. Graham rightly referred to as a feeling of great disappointment and some indignation at the moment. I think it is entirely to the interests of British trade with Canada and our trade with Britain that irritations of that kind should not be permitted to develop. If they start on one side there is apt to be retaliation on the other, whereas all that we want is to carry out whatever agreement we have in a spirit of goodwill and liberal interpretation.

I might mention a concrete case that was brought to my attention this morning, of a shipment of cattle that was sent over from Canada to two different ports. The single shipment was divided into two lots, one lot of 50 being sent to one port and the other lot to another port. At the one port those stockers were classified as fat cattle and slaughtered immediately. At the other port they were admitted as stockers and so regarded.

The Chairman: All out of the same lot?

Mr. Mackenzie King: Yes, all out of the same lot. I do not mind saying that our shippers are anxious to find out how the law is being administered. This I believe was done

designedly by one shipper who divided his shipment into half and sent half to each of the two ports, at the one port they were slaughtered immediately, at the other port they were admitted and regarded as store cattle. That is an actual fact within the past week. It bears out what I say, that some of the officials of the Departments are evidently over-zealous in taking a certain course, at some ports at least, and I think that what is most needed is that the Government itself should make known to its officials the view that was expressed by the Government to our own Ministers.

Sir Robert Sanders: With regard to this question about the store and fat cattle, what the officials of my Department have to do is to carry out the words of an Act of Parliament. The words of the Act of Parliament are that the cattle "must be intended for feeding purposes and not for immediate slaughter." Of course, as I said in the House of Commons once, it is a very difficult thing to calculate the exact amount of obesity that would justify immediate slaughter. I will have it looked into, certainly, but the officials of the Department are as competent men as you can find for judging what, after all, is a somewhat difficult question.

As to the question of the cattle that are too poor, I should like to have further particulars, if Mr. Graham would let me have them. I should be very happy to have the case looked into.

In the course of further discussion the Dominion representatives welcomed the suggestion that arrangements might be made for the reciprocal exchange of pedigree stock, and the Minister of Agriculture agreed to discuss with the Canadian representatives the points they had raised as to the administration of the Act regulating the importation of Canadian Store Cattle.

* * * * *

THE PREVENTION OF BUNT IN WHEAT.

THOUSANDS of bushels of wheat are lost annually in England through neglect of a proper pickling of seed wheat against bunt. When a diseased crop is threshed most of the bunted grains burst, the fine black spores are liberated in clouds and the healthy grains become coated with them. Winnowing may be sufficient to remove unburst bunted grains and broken fragments, but it obviously cannot free the grain from the spores. Grain may also become contaminated from the thresher if the latter has been used previously to thresh the produce of an infected crop, and previously used sacks have been known to contaminate seed corn placed in them in the same way.

The manner of infection is through the young seedling wheat. The spores are carried on the grain and germinate on the softening coat. Once in the plant, the fungus spawn grows with it, maintaining itself near the apex of the plant, and when the ear is formed it makes its way into the young grain. As the plant food passes into the ear for the growth of the grain, the parasite seizes upon it, destroys the tissues, and eventually produces a solid mass of black spores in the grain.

The pickling of seed wheat by a solution of formalin has been tried on a large scale and found reliable. (Formalin is a liquid containing approximately 40 per cent. of formaldehyde gas in solution.) The Ministry recommends the use of this, the solution being at the rate of one part formalin to 320 parts of water (i.e., 1 pint formalin to 40 gallons of water). Mr. E. S. Salmon found that complete control of bunt was secured by using formalin at the rate of 1 pint to 60 gallons of water. From one to two gallons of the solution should be sufficient for four bushels of wheat. It should be slowly sprinkled or sprayed over the grain, which should be stirred, so that all the grains become thoroughly moistened. The solution should not be allowed to form pools under the heap of grain. The seed should then be placed in a heap and covered with sacks soaked in the solution, but not too wet. The seed may then be left for four hours, after which it should be spread out to dry on a clean floor which has been disinfected by formalin solution and allowed to dry before the seed is spread upon it. The sacks in which the seed is to be placed should be treated with formalin solution in the same way, or boiled in water and subsequently dried. Seed wheat treated as advised suffers slightly in germination, and should therefore be sown a little thicker than is usual.

PIG-KEEPING.

III.

W. A. STEWART, M.A., B.Sc. (Agr.),
Northamptonshire Farm Institute.

Systematic Rationing.—The quantity of food required by a growing or fattening pig will depend largely upon its size, and this can be gauged approximately by its weight. Generally speaking, a growing or fattening pig will need about 1 lb. of mixed meal for every 20 lb. of live weight. This is, roughly, equivalent to 1 lb. for every 4 weeks of age. On this basis we can construct the following table which may be taken as a guide :—

TABLE I.

<i>Age.</i>	<i>Approximate Live Weight.</i>	<i>Total Meal per head per day.</i>
3-6 weeks.	20-30 lb.	1-1½ lb.
6-12 "	30-50 "	1½-2½ "
12-16 "	50-80 "	2½-4 "
16-20 "	80-120 "	4-5½ "
20-24 "	120-170 "	5½-7½ "
24-30 "	170-220 "	7½-9 "
Sows in pig	- - - -	4-6 "
Sows in milk	- - - -	8-10 "
Stock boars	- - - -	4-6 "

It should be recognised that these figures are simple representative of a large number of average cases. It is quite possible that breeders and feeders can quote higher weights secured with less liberal diets at earlier ages, but we are not dealing with exceptional cases.

It is doubtful whether it is ever economical to exceed 9 lb. of meal per day to a fattening pig. Even when as much as 9 lb. is given some considerable proportion may pass through undigested in the dung. It is generally advisable to replace some part of the meal ration by using roots or greenstuff. The following figures show the weights of roots and forage crops which are roughly equivalent to 1 lb. of barley meal.

Potatoes	4 lb.
Rape, vetches, lucerne, grass...	8-10 lb.
Mangolds, swedes	9-11 lb.

Rations for Different Classes of Pigs.—Working on the figures for albuminoid ratios and total quantities which have been suggested as guides, and taking such well-known feeding

stuffs as fish meal, linseed cake, pollards, barley meal and bran, rations could be compounded as follows:—

TABLE II.

Age of Pig.	Fish Meal.	Linseed Cake.	Pollards.	Barley Meal.	Bran.	Quantity of mixture per head per day.
						lb.
3-6 weeks ...	10	10	70	10	—	1-1½
6-12 " ...	10	10	50	30	—	1½-2½
12-16 " ...	10	10	30	50	—	2½-4
16-20 " ...	—	—	—	—	—	—
* Bacon pigs ...	10	10	20	60	—	4-5½
* Pork pigs ...	—	10	20	70	—	4-5½
20-24 weeks	—	—	—	—	—	—
Bacon pigs ...	10	10	20	60	—	5½-7½
24-30 weeks	—	—	—	—	—	—
Bacon pigs ...	—	10	20	70	—	7½-9
Sows in milk ...	10	10	50	20	10	8-10
Sows in pig }	10	10	40	40	—	4-6
Stock boars }	—	—	—	—	—	—

* Different rations are given for bacon and for pork pigs of these ages because the pork pigs will be slaughtered at say 20 weeks old and should have a ration with a wider albuminoid ratio than pigs being fed and kept on to 28-30 weeks old for bacon.

The feeding stuffs used in Table II are particularly safe and have been found to give excellent results, but they are sometimes expensive, and at times it may be economical—more especially in the case of pigs over the age of 12 weeks—to introduce other and cheaper feeding stuffs. Palm-kernel cake and rice meal are frequently the cheapest feeding stuffs on the market, and if green food is used with them they can be employed with satisfactory results. In the special cases, however, of young pigs under the age of 12 weeks and sows in the early stages of suckling their litters, unless linseed cake, pollards, barley meal and bran are very much more expensive than other feeding stuffs it is doubtful whether it is really economical to substitute other feeding stuffs in their place.

TABLE III.

Rations including Cheap Feeding Stuffs such as Palm Kernel Cake and Rice Meal.

Age of Pig.	Fish Meal.	Palm Kernel Cake.	Pollards.	Barley Meal.	Rice Meal.
12-16 weeks ...	10	20	20	25	25
16-20 " ...	—	—	—	—	—
* Bacon pigs ...	10	20	10	30	30
* Pork pigs ...	—	20	20	30	30
20-24 weeks	—	—	—	—	—
Bacon pigs ...	10	20	10	30	30
24-30 weeks	—	—	—	—	—
Bacon pigs ...	—	20	20	30	30
In-pig sows and	10	20	30	20	20
gilt and boars	10	20	30	40	—

* See footnote to Table II.

TABLE IV.
Rations composed of Home-Grown Feeding Stuffs and Fish Meal.

<i>Age of Pig.</i>	<i>Fish Meal.</i>	<i>Beans.</i>	<i>Wheat.</i>	<i>Barley.</i>
	%	%	%	%
12-16 weeks ...	10	25	25	40
16-20 "				
* Bacon pigs ...	10	20	20	50
* Pork pigs ...	—	20	20	60
20-24 weeks Bacon pigs	10	20	20	50
24-30 " " "	—	20	20	60
In-pig sows and gilts and boars ...	10	25	25	40

* See footnote to Table II.

Other feeding stuffs such as maize gluten feed, palm kernel cake and coconut cake could be used in place of beans. Maize germ meal might be used to replace wheat, and maize might be employed as a substitute for barley. Any number of different rations can be made up in this way, and the feeder should consider carefully current market values with a view to effecting economies in the making up of rations.

Feeding.—All changes both in quantity and composition of the ration should be brought about gradually. The pig should never be given more wet food than it will readily clear up. If it receives too much it may overeat and upset the digestion. This will cause a check in the rate of growth and development. Such checks do not appear to occur with dry feeding, even though an unlimited supply of food is given, provided that a slow-acting automatic feeder is employed. One of the commonest errors in wet feeding practice is the use of too much water. The food when soaked should be fed normally as a thick porridge, but the quantity of water requires to be varied according to the weather. Meals should be given regularly. Theoretically the oftener the pig can be fed the better. Three meals per day give better results than two, but it is doubtful whether it is economical to feed oftener than three times daily. Two meals daily is the common commercial practice, which is quite satisfactory. When a pig suffers from constipation or goes stiff through over-eating the quantity of food should be temporarily reduced and the diet changed for a time to pollards with a small proportion of linseed cake and bran. Frequently too much starchy food, such as barley or maize, is given to young breeding stock. This produces a soft "flabby" appearance, and if continued to excess may interfere with the breeding capacity.

Young pigs will usually begin to eat at 3 to 5 weeks old, this variation in age depending upon the size of the litter and whether or not the sow is a good milker. At this age new or separated milk is particularly valuable, but the mixture of pollards, fish

meal, linseed cake and barley has given excellent results. This mixture can be used either wet after being soaked or simply dry. When given dry it is most important to see that the little pigs get all the water they need. They should have free access to a water supply. On dry food little pigs are less liable to scour and less likely to develop "paunchiness" than when fed on sloppy food.

It should not be overlooked that no matter how correct the ration may be as regards composition and quantity, good results will not be obtained unless a careful watch is kept upon the pigs and the closest attention paid to the other details of management. If the housing conditions are wet, dark, damp and insanitary, pigs will not thrive. Exercise, fresh air, sunshine, a dry bed, and green food are all as essential as a well balanced ration. It should not be supposed that the pig can live under any sort of conditions without care and consideration. Neglect very soon leads to disaster. It should be remembered that the pig is the most prolific animal and the most rapid grower on the farm. This being so, it all the more needs and deserves reasonable care and attention.

So much has been written on the subject of vitamins that certain pig keepers are very apt to conclude that all their troubles are due to vitamin deficiency. Our experience suggests that the cases of actual vitamin deficiency are probably comparatively few. Much commoner causes of troubles are badly bred pigs, unhealthy and insanitary housing and surroundings, dirty troughs, badly balanced rations, too much water in the food, insufficient attention, and failure to recognise incipient illness or disorders. No one should take up pig-keeping hoping to make it profitable unless he or she is thoroughly interested in it and, being endowed with an open yet critical mind, is prepared to learn both from the accumulated fund of practical experience and the lessons of experimental science.

NOTE:—With reference to the inclusion of fish meal in Tables II, III and IV, it should be pointed out that the Ministry's Leaflet No. 333, which deals with this feeding stuff, is not at present being issued. Its temporary withdrawal was due to representations made to the Ministry by the Pork Section of the National Federation of Meat Traders Associations, which left no doubt that owing to carelessness, both with regard to the quality and the quantity of fish meal fed to pigs, tainted pork and bacon are of somewhat too frequent occurrence.

It should be possible, however, to use suitable brands of fish meal up to within four weeks of killing, with perfect safety as regards tainting, if sufficient care is taken not to exceed the proportion recommended. The rations in the tables are designed with the idea that fish meal is omitted during the last four weeks of feeding.

FOWLS ON THE FARM.

J. W. HURST.

DURING 1922 the poultry produce imported into the United Kingdom (mainly Great Britain) from countries abroad, exclusive of Ireland, exceeded £15,000,000 in value; and the Irish exports, nearly all of which entered Britain, approximated to a value of £11,000,000 in 1921. These are big figures, yet it is to be noted that the quantities of eggs and poultry imported fall considerably short of pre-war dimensions. The warning given by the Departmental Committee on Distribution and Prices of Agricultural Produce is to the effect that "producers in those Continental countries which, owing to internal conditions, have temporarily ceased to export poultry produce to these shores will sooner or later seek to re-enter the British market."

On the other hand, the estimated value of the production of eggs and poultry on the agricultural holdings of Great Britain in 1922 is given as £16,000,000 (Part III, *Agricultural Statistics, 1922*). This estimate does not include the production of fowls kept by cottagers and private residents, and these have been assumed to be about one-third as many as the birds kept on agricultural holdings. However that may be, it does not affect very materially the obvious conclusion that farmers, as such, have an immense opportunity for the development of poultry keeping as a specific branch of their work.

It is, perhaps, necessary at the present time to reaffirm and emphasise the fact that the great bulk of the eggs and table poultry produced and marketed in this country are the output of general farms, and that it is mainly in connection with other uses of agricultural land that there exists such scope for that expansion and development that alone will resist foreign competition. It is true that there has been a remarkable increase in the number of commercial egg farms during the past few years, but the combined output of such establishments is very small by comparison with the farmers' bulk of poultry produce.

Nevertheless, this production in the past has been almost fortuitous, and farmers as a class have not yet begun to realise the extent of the influence they are capable of exercising upon the egg and table poultry trade of this country. Until quite recent years the fowl on the farm was regarded rather as an

unconsidered trifle than a business proposition. It has remained for specialist breeders to provide proof—through the medium of the egg-laying tests—of the possibilities of prolificacy and profit that exist in the poultry industry. Yet the mere multiplication of specialist breeders, and the efforts of commercial egg farmers, will probably not be commensurate to the needs of the future, or sufficient to enable the home industry to take full advantage of the more immediate opportunity.

The chief hope in this direction lies in the largely unrealised and at present latent power of general farmers to develop egg and poultry production as a serious branch of agriculture. The general farmers throughout the country are the only people who are in a position to increase the aggregate output sufficiently without avoidable loss of time. They also are, as a class, able to do so under the most favourable economic conditions.

Advantages of Position.—Farmers are already in occupation of the required areas of land. They have no need for any great capital expenditure upon plant, their fowls find the most suitable accommodation imaginable, and their produce need carry no undue proportion of establishment charges. Moreover, his knowledge and experience of live-stock keeping generally should enable the average farmer to appreciate broadly the requirements in this branch of production, and to realise the benefits that result from good management. The agriculturist, therefore, possesses special advantages that qualify and equip him more particularly than others to make the most of the opportunity that exists in this direction. Circumstances have recently combined to turn his attention more seriously and definitely than hitherto to remunerative side lines. These must bulk more largely now than formerly in his plans.

There are considerable and essential differences between what is termed commercial poultry farming and farm poultry keeping. The former necessitates a relatively big initial outlay, a reserve sufficient to meet all expenses—including living—until the enterprise is established upon a paying basis (usually for a fairly long period), and the fowls have to bear all, or most, of the rent, labour and other charges, in addition to such costs of production as are inevitable under any conditions. Further, an outbreak of disease may at any time destroy the chief or only source of income. Farm poultry keeping is not similarly handicapped, as regards capital expenditure or costs, whilst the loss from epidemics is more easily avoidable, and the results of a possible outbreak far less crippling.

Penning arrangements, so far as they may be necessary on the farm, are much less elaborate and expensive than they must necessarily be on the poultry farm proper. The burden of rent is offset by the value of the manurial product on agricultural land. Feeding is very much less expensive, under ordinary good management. Further, investigators have found that the profit on capital employed is capable of being greater in the case of poultry than in connection with several other branches of production on farms. It has been shown, indeed, that in several instances the production of eggs and poultry has been the only consistently profitable branch, on a group of farms kept under observation, under the conditions that have prevailed recently.

Benefits to Cultivation.—The relation of poultry keeping to general farming, and fruit growing, was discussed in considerable detail at a conference held this year at the Harper Adams Agricultural College, and many extremely interesting facts were put forward in proof of the profitableness of fowls as an adjunct to cultivation. The benefits to the land and the growth of crops that result from the distribution of the nitrogenous manure deposited by the birds was clearly shown to be in itself amply sufficient to free the fowls from a charge for rent; whilst, in addition, the greater health and freedom from damage and disease of trees and plants, due directly to the destruction of pests of various kinds, is an increment of almost inestimable value. This holds good in respect to both fruit and farm crops.

From the farming point of view, therefore, poultry under good management aid cultivation, altogether apart from the possible profit on their produce—and the margin of profit is widened by the economies of farm poultry keeping by comparison with those of poultry farming. In spite of these well-authenticated facts the agricultural land of the country is notoriously very greatly understocked with fowls, in relation to the number which it would carry without any interference with its other uses for stocking and cropping.

Food and Labour Costs.—Fowls kept on the general farm necessarily cost considerably less to feed than those that are kept by specialist egg farmers. They have a very much larger proportionate range, and when distributed judiciously (as they must be in accordance with the method of cultivation) they find a large amount of natural food by foraging over pasture, arable (including stubble), and woodland. A great part of the food supplied, in addition to that which they find, is frequently grown on the farm that carries the fowls, including grain, green

stuff, roots, clover hay, etc.; and, whilst meals must necessarily be obtained from the miller, the purchase of such mash ingredients as meat meal or fish meal may often be obviated by the availability of other and cheaper forms of flesh food.

The question of labour, however, requires much more particular consideration than it has usually received in the past in regard to farm poultry keeping. It is evident that if the fowls are to produce the highest possible return they must be put in charge of some particular person or persons possessed of sufficient special knowledge to manage them to the best advantage. This is obviously as true of the poultry department as it is of any other branch of live stock kept on the farm. It may or may not be a whole-time job. That is a matter that depends upon the circumstances of the individual farmer. If the operations are sufficiently extensive it should prove profitable to employ a properly trained poultry man or woman, or, as some large occupiers of agricultural land have done already, engage a game-keeper to take control. Under some conditions it has been found most satisfactory to pay a bonus to one or more of the labourers with an aptitude for the work. A farmer in the south-east who rears some thousands of table chickens annually pays his men threepence for each bird brought to a fattening age and condition. The same principle could be applied in some circumstances to egg production.

System Essential.—In any case it is essential to systematise the poultry work on the farm, and this necessitates the putting of some capable person in charge, with full responsibility for results, whether as a sole occupation or in conjunction with employment in other directions, although the opportunity for such other employment would in most cases be seasonal rather than regular. This is, however, a matter for regulation to suit particular and individual needs; the main point is to ensure the responsibility of some person or persons, of ability equal to that of those in charge of the several kinds of bigger live stock. Given this ability, and the suitability of the stock, the better returns should much more than compensate for the relatively small addition to the cost of management.

The suitability of the stock is, of course, a vital factor. It is necessary to raise the level of quality of the fowls kept on, probably, the great majority of the farms in Great Britain. It is not only desirable to increase the head of stock on farms generally, but it is essential that farmers should keep the best birds only, to ensure the maximum individual output, whether

of eggs or chickens. The lessons of milk recording may be applied equally well to this branch of production. Just as it pays better to own a few deep milkers than many more animals of average class; so also is it more remunerative to stock a smaller number of fowls of a prolific strain than several times the number of mediocre birds. The keeping of egg records is as economically important as the keeping of milk records; it is essential to maintain a good flock-average of production.

In the selection of breed, however, the main purpose of production must dominate the choice, but the farmer must bear in mind that the egg specialists have made considerable use of sitting breeds in making laying strains. This has resulted in some amount of breeding-out of the incubating instinct, and in the reduction of the table qualities of the strains of general purpose breeds that have come under this influence. The main purpose of the farmer may be egg production, but he usually requires at the same time a class of cockerel that will make a passable table bird. The farmer, too, is wont to depend upon the broody hen to hatch and rear, to a much greater extent than many other poultry keepers.

The level of production should be set at a reasonable height in relation to the type and general characteristics of the breed in question. For instance, a flock-average of 170 to 180 eggs per bird per annum would be excellent on the commercial egg farm, where egg production is the chief object; it would be higher than most—150 is probably nearer the average. But the attainment and maintenance of any such yield depends upon strain as well as breed, and if birds are expected to breed good table chickens as well as to produce a reasonable number of eggs, the output of the latter must not be so developed as to detract from the suitability of the former. The yield of fowls kept under farm conditions may fall somewhat short of what is attainable under more artificial methods of management, but the costs of production are lower, and with a breed and strain capable of laying comparatively well in autumn and winter the average profit should be satisfactory. The general farmer will usually be well-advised to make choice of a general, or dual-purpose breed, and to make sure that the birds are of a type to justify the description.

Organisation of Marketing.—Finally, there is the question of marketing, and unless the present methods are altered efforts to increase and improve production will be very largely nullified. If poultry keeping is to be brought more generally into the

scheme of farming, the marketing conditions and facilities must be so arranged that they give the required encouragement to enlarge the output. It is quite evident that the solution of the marketing problem is to be found in some method of co-operation sufficient to direct and control the system of distribution. It is here that farmers as a class have at least the nuclei of the required organisation already at their command, in the existing agricultural co-operative societies, a few of which have, indeed, established branches for the sale of eggs and poultry. Whatever method may be deemed best for the local purpose, the need for some central control of distribution—as recommended in the report of Lord Linlithgow's Committee—cannot be gainsaid.

That the generality of farm producers could do very much better than they have done hitherto is evident from the experience of those who have made the experiment of marketing upon a co-operative basis, as, for instance, in East Anglia. In Denmark, the most commonly quoted example of this form of co-operative endeavour, there is a central society which embraces about 540 affiliated local bodies of producers, and the success of their operations is a matter of common knowledge. There has also been a noteworthy development of the co-operative method of dealing with eggs in the United States of America; and, in short, it is the well-organised co-operation of our foreign competitors against which our home producers have to contend in their own home markets. They can no longer afford to ignore this economic weapon, which they must, perforce, adopt in defence of their own trade and its development. Farmers are better able than any others to put the required machinery in motion.

All the conditions combine to make the present time favourable to the development of egg and poultry production upon the general farms of Great Britain, and to the consolidation of the home producer's position in the home market. Here, at least, is one industry the retention and enlargement of which is within our grasp, and farmers are the only class in a position to seize the opportunity promptly and to meet the demand upon a big enough scale.

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NOTTINGHAM COUNTY EGG LAYING TRIALS.

J. A. CASEBY,

Small Live Stock Instructor, and

R. N. DOWLING, N.D.A.,

County Agricultural Organiser.

NOTTINGHAMSHIRE is a county that offers good prospects to commercial poultry keepers on both farm and small holding, for there are good markets close at hand and soil and climatic conditions are suitable. The number of poultry farms is comparatively small, but there are very large numbers of individuals who devote part of their time to poultry keeping and who look upon it as a business proposition. An account of the County Laying Tests which have been organised by the County Small Live Stock Instructor is of special interest as showing how such trials can be run on self-supporting lines without financial aid from the local authority or the Ministry.

Inquiries were made among poultry keepers in the county as to the possible support in the form of entries for competition that might result in the event of a County Egg Laying Station being set up, and it was soon evident that there would be no lack of competitors. As each would pay a proposed fee of £1, a fairly certain revenue from this source could be relied upon.

Then came the question of the necessary equipment, in the form of poultry houses, wire netting, posts, etc. A firm of poultry appliance manufacturers was approached with a proposal which, after consideration, its principals agreed to, namely, that they should provide practically the whole of the equipment on a loan basis, and that the county should have the option of taking it over at a price at some future date, should they so desire. This arrangement made it possible to proceed with the scheme.

The next step was to find a suitable centre and farm, with a reliable manager to carry on the work of feeding and general management, who would undertake this without payment beyond the proceeds of the sale of eggs.

Several possible centres were examined, and it was finally decided to establish the station on Mr. S. V. Playle's poultry farm at Mapperley, Nottingham. This farm is situated within easy access of Nottingham, and can be reached by tram from any of the railway stations in the city. The situation is a very exposed one, being some four hundred feet above sea level, wind-swept, and sloping to the north. The birds are therefore severely

tested for stamina as well as egg production. The soil is a very heavy clay, and is of the Keuper Marl geological formation.

It was felt that whatever success was obtained under these conditions would prove beyond doubt the possibility of keeping poultry successfully anywhere in the county.

Equipment of Pen Section.—In the first test, 1921-22, there were 20 houses and runs and a large two-compartment hut used as a food store and office. In the second test, 1922-23, six extra houses and runs were put up to enable 26 pens to compete. The pen houses are of the Lancashire Cabin type and measure 6 ft. x 4 ft. x 5 ft. Each house has a floor raised on bricks, and six windows, the glass being removable. There are four nests and also a dropping board and one perch. The runs are 25 yd. by 6 yd. and each run has a gate opening on to the avenue. A metal water fountain and metal grit box hang on the outside of each house, and a V-shaped trough is used for the crumbly feed.

Equipment of Single Pullet Section.—The large hut used in 1921-22 as a food store and office was converted into a poultry house by putting an exit door for the fowls in the front of each compartment. Six trapnests were put in each half and also a dropping board and perch. There are four large windows in the hut, and the upper half of each window is hinged to allow for greater ventilation. The outside runs are 50 yd. by 12 yd. and about 20 pullets can be run in each of the two sections of this test. Mixed heavy breed pullets are in one half, and mixed light breeds in the other.

Management.—Mr. Playle has acted as manager and personally does the work of feeding and egg recording, and is responsible for the labour for cleaning and disinfecting the houses and watering the birds. The feeding in the morning is of warm crumbly mash, which is fed in troughs at dawn. The system of feeding on a well-balanced ration is carried out carefully. Each pullet gets as much mash as it requires, and heavy laying means more food consumed. The mash is composed of high-grade meals as follows:—

<i>Parts by weight.</i>		<i>Parts by weight.</i>	
Middlings	4	Fish, meat and bone mixed	1
Sussex ground oats	2	Dried yeast	1
Flaked cooked maize	1	Alfalfa	$\frac{1}{2}$
Biscuit scrap	1	Charcoal	$\frac{1}{4}$

A very small quantity of cod liver oil is added during east winds, frost or snow. Cabbage is given when the grass loses its nutrient value. The albumenoid ratio of the meal mixture is 1 to 3 $\frac{1}{4}$. This appears to be a rather narrow ratio, but it is

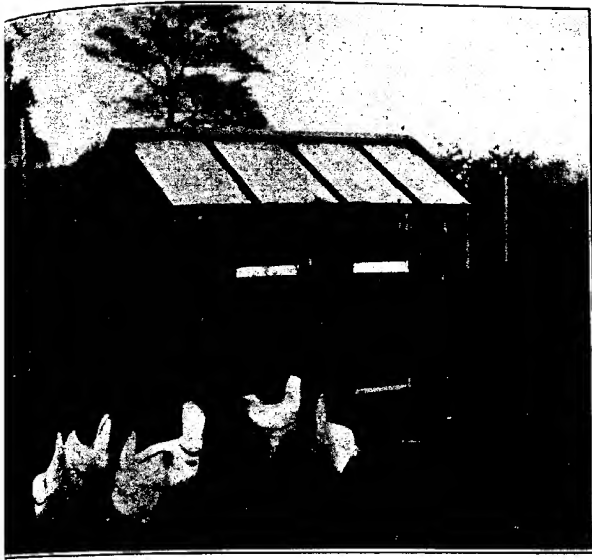


FIG. 1.—Type of House used at Nottingham County Egg Laying Trials.
Runs 25 yd. \times 6 yd.

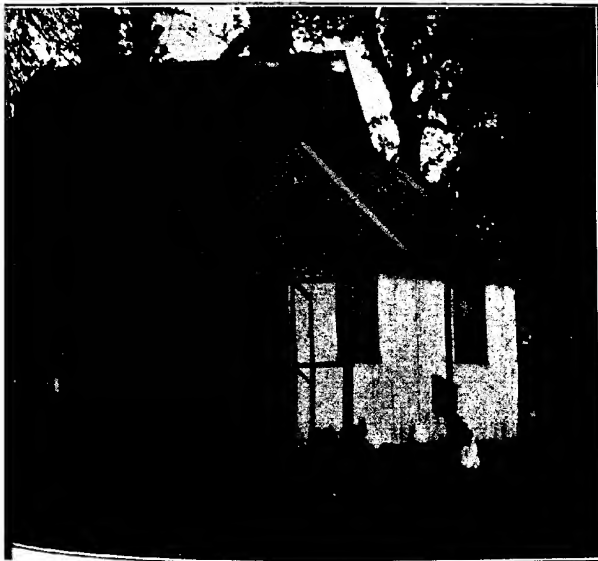


FIG. 2.—Divided Poultry House with two large runs.

widened considerably when one takes the grain portion of the ration into account.

The afternoon feed is composed of sound cereals such as wheat, oats and cracked maize in rotation, buried in a good depth of chopped straw and chaff. The houses are cleaned out on alternate days, and the dropping board and perches lime-washed weekly. The water fountains are replenished daily, and the grit and shell added to the hoppers as required.

Egg collection is done as late as possible each day, to ensure getting all eggs laid that day and the number is recorded on the record sheet, and also the pen number on the egg. Broodies are removed to broody coops with a slatted bottom raised on legs. The broody pullets are fed and watered while shut up, and returned as quickly as possible to the pen when it is seen that they stop "clucking."

The Objects of the Test.—These can be looked at from two standpoints: (1) That of the Nottinghamshire Education Committee, and (2) that of the individual competitor. Laying tests show farmers how it is possible to get paying numbers of eggs in winter. They act as demonstration centres (as many as 250 people have been at the Nottinghamshire test in one day). They are a guide to poultry keepers as to where the best laying strains are bred, and high-grade stock is distributed by them throughout the county.

Taking the competitor's standpoint we have the advertisement for his stock, the possibility of winning valuable prizes, and the profit from the sale of eggs.

With the following reservations the manager retains as his property all eggs laid. *The public* can purchase eggs for hatching from, say, the leading pen at 15s. per doz. when eggs are, say, 2s. 6d. retail; *the owner* of the pen receives the 15s. less the retail consumption price which the manager receives, and 6d. per doz. which the Education Committee receives. *A competitor* can purchase eggs from his own pen at retail consumption price plus 6d. per dozen. *The manager* can set for hatching any eggs not disposed of, but he cannot sell sittings except officially as described.

Methods of Scoring, Entry Fees, etc.—The pen section is composed of entries of 6 pullets in each pen, and one competitor can only enter one pen. Any breed or first cross is allowed to compete. All competitors must reside in the administrative county of Nottingham and must certify that they reared the pullets on their own premises.

The pen section is not trap-nested but simply scores on total number and weight of eggs produced. The margin of error is negligible, as eggs laid on the dropping board, in the litter or in the run are recorded. Shell-less eggs as well as double-yolked or very small ones all go into the score. If an egg is fit to eat it is fit to be added to the score. Small eggs are handicapped not by being ruled out altogether, but by having a much lower total weight. Weight, not number, counts in the final score, and it has happened that the sixth pen actually laid more eggs than the second pen.

In the single pullet section (heavy and light breeds) all pullets are trap-nested and the records are of course not so accurate owing to a very few unrecorded eggs laid in the litter. Scoring in this section is also by total weight.

The entry fees are fairly low so that small poultry farms or private individuals can be represented. £1 per pen of 6 pullets and 4s. per pullet in the single section is within the reach of all. Competitors may send a cockerel to the test in January to mate to their pullets, and can then obtain eggs for hatching as indicated above. A charge of 3d. per week for cockerels is made to cover food costs.

It will be seen that the tests demonstrate breeding value and stamina as well as the capacity to lay under adverse conditions. Eggs set from the first position pen in both tests have proved to be of high hatching quality and the chickens have reared well. The manager finds all foods, litter, etc., at his own cost. He also gives the land and labour. The Nottinghamshire Education Committee receives the entry fees and 6d. on each dozen eggs sold for hatching. In the first test about £24 was received by the Committee and in the second test about £36.

Class of Competitor and Breeds entered.—In the first test, 1921-22, there were five pens of White Wyandottes, six pens of White Leghorns, three of Rhode Island Reds, two of Black Leghorns, one each of Buff Orpingtons, Croad Langshans, Anconas and Light Sussex. Six competitors run from 250 head of poultry each. Nine run from 100 to 150 head and the remaining five were backyard poultry keepers with up to 40 head. Nine of the competitors were women and eleven were men. The second test, 1922-23, with 26 pens, included nine pens of White Wyandottes, eight pens of White Leghorns, three of Rhode Island Reds, two of Light Sussex, one each of Black Leghorns, Buff Orpingtons, Sicilian Buttercups and a first-cross Wyandotte-Rhode Island Red. The competitors were owners

of flocks of approximately 200 head, except one egg farm and four backyard poultry keepers. Seven of the 26 competitors were women.

Result of the Tests.—The total number of pullets competing in the first test (1921-22) was 120, and the egg yield from 1st November to 30th April, was 12,394. The average per pullet was 103 and the deaths amounted to three. In the second test (1922-23), there were 193 pullets. The total egg yield was 15,514 eggs. As the second test started on 1st October, 1922, instead of on 1st November as in the previous year, the average per pullet is less,—October, a lower production month, being included, and April, a high production month, being excluded. The average per pullet was 82 eggs. The deaths amounted to seven, but two of these were killed by either a fox or a dog breaking into a pen. The tests have both been quite free from infectious disease, all deaths from disease being caused by ovary trouble.

Considerable numbers of eggs were taken from the mated pens by the owners for incubation, and the hatching results in most cases were excellent. The sales of eggs to outside poultry keepers were small owing to the price charged for eggs from the leading pens being high for most people. The idea that it is not advisable to breed from high production pullets, which is generally accepted, has been disproved by the reports of high hatchability and high rearing results. In one case fifty-three chicks hatched out of sixty eggs from the leading pen and almost all were reared.

Comparison of Breeds in both Tests.—Rhode Island Reds won the first test with 766 eggs weighing 96 lb. 6 oz. This gives an average per pullet of 127 eggs. White Leghorns won the second winter's test with 649 eggs weighing 77 lb. 15½ oz. The average per pullet was 108 eggs. By comparing the results of the leading pen in both tests for November, December and January (12 weeks) we get the following:—1st Test, Rhode Island Reds, 362 eggs. 2nd Test, White Leghorns, 308 eggs.

Prizes.—Three silver medals and four bronze medals, and certificates of merit, are awarded to the best pens.

Cost of Feeding.—The cost to feed each pullet works out at 2½d. per week. The mash cost 15s. 6d. per cwt. and the grain 11s. per cwt., and 1 lb. of each is consumed per week. The high production pens take more, but in others very little is eaten when partial moult, broodiness, or resting is going on.

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SECURITY OF TENURE FOR ALLOTMENT HOLDERS.

E. LAWRENCE MITCHELL,
Ministry of Agriculture and Fisheries.

THE article which appeared in the August issue of this *Journal*, entitled "Permanent Allotments: Security of Tenure and How to Obtain It," was of considerable interest in drawing attention to a subject which is arousing a great amount of discussion among allotment holders at the present time. The problem of security of tenure is a burning question with those who cultivate allotments in their spare time. The Report of the Departmental Committee on Allotments, 1922, contains the following passage:—"The evidence we have received from the representatives of the allotment holders has been unanimous as indicating a keen desire for security of tenure. It is obvious that the cultivators of allotments will be more likely to make greater use of their land and much better cultivation and increased production will result if security of tenure is made possible. In order that such security may be given, however, it is necessary that land should be purchased by the Local Authority or by an Allotments Association."

In order to meet the situation, the Committee recommended that local authorities should purchase land for allotments wherever practicable within, or on the outskirts of the towns, and that co-operative allotment associations should be empowered to obtain loans for the purchase of land from the Public Works Loan Commissioners.

As regards the first of these recommendations a condition militating against its adoption is the fact (in the words of the Committee's Report) that "in the large cities and towns it is probable that the capital value of land within reasonable access of the homes of persons who desire to cultivate allotments, is so high as to prevent the purchase of land by Local Authorities, if a condition precedent to the acquisition is the payment of economic rents by the plot holders." Under existing legislation, a local authority is required to make its allotments undertaking self-supporting, except that expenses of acquisition, of making public roads, and sinking fund charges in respect of loans raised in connection with the purchase of land need not be taken into account. It is, of course, true that if land is purchased at a high figure, the rent which the local authority will be obliged to charge to the plot holders will be correspondingly high, but it

is a matter for careful consideration by the allotment holders themselves whether a higher rent is not more than justified in consideration of the advantages which accrue to the plot holders in obtaining security of tenure.

Hiring versus Purchase.—To illustrate the point, let it be supposed that an urban authority are faced with two alternatives: (1) *hiring* for allotment gardens land with a present, or prospective building value, or (2) *purchasing outright*. Under the terms of hiring, the owner would doubtless be entitled to re-enter and end the local authority's tenancy at any time after three months previous notice in writing if the land were required for building, mining or other industrial purposes, or for roads or sewers necessary in connection with any of those purposes. The allotment holders would therefore be liable to be turned off their plots at any time during the year after three months notice, although it is true they would be entitled to compensation for the crops growing on the land in the ordinary course of cultivation of the land as allotments and for manure applied to the land. The rent payable by the local authority to the landlord might be anything from £3 to £8 an acre, the higher figure being payable where the land had an accommodation value owing to its proximity to a large city or town. Assuming that the rent were fixed at £8 an acre and the local authority added say 10 per cent. for administrative expenses, management, bad debts, unlet plots, etc., the rent payable by the allotment holders would be £8 16s. an acre. Each acre may be expected to provide 15 plots of 10 rods each, after making allowance for paths, and the rent of a 10-rod allotment would therefore work out at approximately 12s. per annum.

As an alternative to hiring, let it be supposed that the local authority could purchase the land outright for £300 per acre. A loan could in all probability be obtained from the Public Works Loan Commissioners in respect of the purchase money, the repayment to be spread over a period of 80 years, the rate of interest current at the present time (October, 1923), being $4\frac{1}{2}$ per cent. The loan charges in respect of a loan of £300 would be £14 11s. 10d. per annum, including repayment of principal, and adding the same amount for administration as in the case of hiring, namely, 16s. per acre, the rent which the local authority would have to charge to the plot holders excluding repayment of principal would be approximately £15 per acre or £1 per plot of 10 rods—a difference of only 8s. per annum per plot as compared with the 12s. rent if the land were hired.

The point for consideration by plot holders generally, is whether the fact that security of tenure could be obtained by the payment of an additional rent of 8s. per plot annually, would not justify a large extension of the provision of allotments on a permanent basis by means of purchase of the land by a local authority. There seems considerable force in the contention that the advantages which the plot holder would enjoy under conditions which would enable him to feel absolutely secure in his tenancy so long as he paid his rent and cultivated his plot properly, are well worth the additional annual payment.

It should be remembered in this connection that the amount of rent payable by a plot holder for his allotment is, after all, the smallest contribution he makes towards the cost of producing his crops. The purchase of seeds and manures, is, of course, an important consideration, but the really heavy item to be considered in the production of crops on an allotment is the allotment holder's labour. This labour is, however, given in his spare time, and is really a recreation, and is labour for which he has no market. It is submitted that the value of the crops produced from a 10-rod allotment under normal conditions and with an ordinary amount of skill on the part of the cultivator is such that a payment of 8s. per annum in the nature of rent is really a very small item. Under the system where the plot holder has security of tenure he can cultivate his plot without risk of disturbance; he is encouraged to plant crops, fruit bushes, trees, etc., which continue productive for more than one year; he is more likely to erect a permanent and attractive shed for his tools, etc., and in all probability to beautify his allotment with the addition of a few flowers which, without reducing materially the food productivity of his plot would make it more attractive as a feature of the landscape.

It may be explained that in comparing the two alternatives of purchasing or hiring land for allotments, the cost of erecting any necessary fencing, providing water supply, making paths, and such items, may be disregarded, as such expenditure will be common to either scheme; but where land is purchased with resulting security of tenure for the allotment holders, it is obvious that there is wider scope for the carrying out of more or less permanent improvements, and a certainty that the allotment holders will reap the full reward of any such expenditure.

Loans to Associations.—With regard to the second recommendation made by the Departmental Committee as to loans being granted by the Public Works Loan Commissioners to

Co-operative Allotment Associations, it was not considered practical for effect to be given to the recommendations in the recent Allotments Act of 1922 for the reason that money was not available for the purpose at the time of the passing of the Act. In view of this it is desirable to consider whether loans from the State direct to a society are a necessary corollary to the purchase of land for allotments by such associations. A particular case, as described in the article in the August issue of this *Journal*, would appear to indicate that direct loans by the State are not essential where the instinct of co-operative self-help is already sufficiently developed amongst the members of an allotment association, and particulars of other cases, which are given below, of societies which have actually arranged the purchase of land for allotments, appear to indicate that given the necessary ability and energy on the part of the plot holders and the officers of an association, there is no reason why a considerable extension of the purchase movement should not take place.

Warley Freeholders, Limited.—In the Warley district, on the outskirts of Birmingham and lying between Oldbury and Smethwick, about 12½ acres of land had been provided for allotments by the local authority under the Defence of the Realm Regulations. The tenants realised, however, that as the land had been provided under emergency war legislation there could be no security of tenure, and in 1919 they approached the local authority and asked them to purchase the land so that it could be let under more permanent conditions. The local authority could not see their way to purchase the land and the tenants then approached the owners direct with the result that the land with three cottages was offered to them for £2,700. It was decided to accept this offer and the allotment holders formed themselves into the Warley Freeholders, Limited, a Society registered under the Industrial and Provident Societies Act and affiliated to the Agricultural Organisation Society, the Secretary of the Society being Mr. R. C. Woodward. One of the members, Mr. J. E. Taylor, lent the Society all the purchase money at 4 per cent. interest free of income tax, and it is doubtful whether the scheme could have been carried through without an advance on such favourable terms. Each member was required to become a shareholder and pay at least £5, following this with periodical payments until he held shares to the value of the plot he wished to purchase. A call on the members resulted in a payment of £537 15s. by the 31st May, 1919. This enabled matters to proceed. The next step was to get the balance of the borrowed money from the members. They paid as much as they were able on the pay nights, the minimum being 10s. every four weeks. By the 30th September, 1920, no less than £1,000 had been paid off, and a year later on the same date this had been increased by £490. At the annual meeting the members decided to inaugurate a "mutual scheme" to endeavour to finish the matter as owing to unemployment and other causes a few members were transferring their shares.

The plan arranged was that the front portion of the land should be sold for building purposes and that the cottages also should be sold. The rear

portion of the land, about 8 acres, was sold; as allotments to member shareholders of the society and only eight shareholders were repaid their share capital in lieu of taking up land, the remaining 90 members allowing their money, which they had already paid in, to remain as payment for land allotted to them. The scheme was a financial success and after all expenses had been paid, interest at the rate of 5 per cent., amounting in all to £202 8s. 9d., was paid on share capital from the start and a surplus of £329 7s. 6d. was returned to the shareholders at the rate of £3 17s. 6d. for each full share. The late shareholders own the plots on condition that no houses shall be erected and that the ground remains as allotments. By co-operative methods security of tenure has been obtained and an open space under garden cultivation has been permanently secured.

Witton and District Allotments, Limited.—A further example is that of the Witton and District Allotments, Limited. In this case an area of land comprising 80½ acres was under cultivation as allotments by the society when it was purchased by Farrow's Bank. It was valued in the Bank's assets at £25,000, but when the Bank went into liquidation the society was successful in purchasing from the Official Receiver for £7,000. The society, which was duly registered and affiliated to the Agricultural Organisation Society, purchased, in addition to the land, a farm house and farm buildings for the sum of £1,500. Possession of the house has not yet been obtained, but the farm buildings have been utilised for the purpose of a social club, the farm yard being converted into a bowling green; the barn into a lecture and concert room; the cowshed into a games room with a billiard table, and the cartshed into a refreshment room, ladies room and office.

There are some 800 plot holders and a further 100 persons are members only of the social club. Each plot holder pays a membership subscription of 2s. 6d. plus 8d. for a card annually, together with 10s. rent for his plot, averaging 300 sq. yd. Social members pay 1s. per quarter. The society were fortunate in raising £6,000 from a Bank at 5 per cent. interest. Each plot holder is required to take at least one £1 share, but it is expected that each should become a shareholder to the value of £5, shares being payable by instalments if desired, the maximum amount which any member may invest in the society being £200. It is hoped that the borrowed money will be paid off in two years. An effort is being made to raise 1s. per member per week during this period, and it is anticipated that this, with the profits of the club (which is fully licensed and which has a turnover of £100 per week), will produce the necessary money in that time. Another source of income will be the selling of the frontage land in building plots.

Kidderminster.—Another example may be quoted of land at Chester Road, Kidderminster. In this case 12 acres of land were purchased for £2,350, and after allowing for cartways was divided into about 90 plots of 600 sq. yd. each. The price fixed for the plots varied from 2s. per sq. yd. for building land adjoining the roadway down to 7d. per sq. yd. for the back land. In order to obtain ready money, purchasers of the building plots were required to pay a deposit of £10 and others £5, the balance to be paid off at the rate of £1 per month. A society, known as the Chester Road Land Society, was formed. The first meeting for the paying of instalments was held in

October, 1920, when no less than £609 was paid in by the members. The men took possession of their plots on 1st November of that year, and by 31st December another £600 had been collected, the remainder of the purchase money being borrowed from the Bank. By February, 1923, only six members out of about 80 had not completed payments, and there was a balance at the Bank. Water has been laid on at a cost of £125, and this expense and upkeep of roadways, etc., has been paid off. The building plots have already appreciated in value. Mr. A. H. Weavers, of Kidderminster, who was mainly responsible for the original scheme, has carried out a similar scheme at Offmore Lane, where 42 plots of approximately 600 sq. yd. each have been purchased by the members of the Offmore Land Society.

Beckenham Allotments.—Another instance is the Beckenham and District Allotments Society, Limited, who purchased in 1921 some 2 acres of land at a cost of £92 10s. per acre, including all legal expenses. This land has been cut up into 30 10-rod plots, a standard rent of 1s. per rod being charged, bringing in £15 per year, out of which the society pay £5 for road and upkeep, leaving approximately about £10 per annum for the repayment of loans, which it is expected will be paid off in 19 years. Each member taking up a plot is required to lend to the society a minimum of £1 and maximum of £5, free of interest, repayable at three months notice.

North Mitcham Allotments.—Another instance of co-operation in practice is afforded by the North Mitcham Improvement Association's scheme. The main feature of the scheme is that while there was co-operative bargaining without liability, when agreement was reached as to details it was possible to secure individual payment and contract. From a local landowner a verbal option was secured on 7 acres of "back" land which had been used for allotments during the war and was not convenient for sports purposes. With the aid of the general fund of the new local association, a meeting was advertised for the purpose of discussing the scheme, and the support was sufficient to allow the acceptance of names of prospective purchasers. A local surveyor voluntarily prepared a plan which allowed for 92 10-rod plots with 10 ft. roads for approaching each. The price per plot was £20, with £5 to provide for roads and fencing, and restrictions were placed on building. The landowner agreed to accept £1,840 for the land and to take payment by instalments from 60 per cent. of the purchasers, the vendor's solicitors collecting the purchase price of each plot, whether paid in one sum or by instalments, and also the £5 per plot for development, in respect of which they acted as bankers. The solicitors on both sides charged merely nominal fees. The roads were vested in trustees appointed by the plot owners. The advantages of the scheme of permanent allotments are evident; the effects of ownership are seen in the succession of first-rate crops which have since been grown.

It will be seen from the particulars given above that there is a wide scope for variety in the details of schemes for the purchase of land for allotments, and the circumstances of any particular case may bring forth difficulties which will have to be overcome. On the other hand, experience may prove that in other cases difficulties will be less. For instance, it may be found that

owners of land will be agreeable, when selling land to allotment associations, to allow a considerable proportion of the purchase money to remain on mortgage, thus reducing the amount of capital to be provided, in the first instance, by the members of the association. Moreover, where part of the land purchased has an immediate building value, the selling off of the frontage land makes the retention of the remainder of the allotments an easier financial proposition. Similarly, in the acquisition of land, part of which has a potential building value, the scheme might partake of the nature of a building development scheme hand in hand with the provision of allotments on the back land. In any such case, the important point which has to be borne in mind is that the main object of the scheme, namely the provision of allotments to be utilised as such on a permanent basis, can only be achieved if conditions are imposed laying down clearly that the land shall remain under allotments in perpetuity; and where an association sells plots on the "allotment" portion to its members it seems desirable that restrictions should be imposed as regards building, as otherwise the main object of the scheme might be defeated.

It may be stated as an axiom that co-operative effort on the part of either an association or individuals, both in the direction of forming an association and carrying on the administrative work, the provision of labour for erecting fences, making paths, etc., is essential if the cost of the scheme is to be kept within reasonable limits. In the past, would-be plot holders have usually looked to the local authority to do practically all the work, whether in regard to provision of land, or administration, equipment, etc. The cost of all such work, however, has had to be recovered from the allotment holders in the form of rent, with the result that complaints have been made of the high rents charged. But with co-operative effort on the part of all concerned—the local authorities, allotment associations, and individual allotment holders—there seems no reason why the purchase of land for allotments with the resulting security of tenure should not be largely extended.

The writer is indebted to Mr. R. C. Woodward for information as to Warley Freeholders, Ltd., to Mr. Albert H. Weavers as to the Kidderminster schemes, and to Mr. A. W. Burgess as to the North Mitcham Improvement Association, Ltd.

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YOUNG FARMERS' CLUBS.

MISS E. H. PRATT, O.B.E., B.A.,

Inspector, Ministry of Agriculture and Fisheries.

Origin.—The Young Farmers' Clubs movement had its origin in America, and Farmers' Bulletin No. 885, issued in 1910 by the U.S.A. Department of Agriculture, suggests that it began, under the auspices of the College of Agriculture of Cornell University, as a development from nature-study lessons. By 1910 the Cornell Farm Boys' and Girls' Clubs had an aggregate membership of about 75,000, and the Cornell Rural School Leaflet, through which the movement was largely directed, was distributed to about 7,000 teachers and school commissioners. Similar progress was made in other States, and in 1912 the Federal Department of Agriculture supplemented State aid by a grant of 4,600 dollars. Federal financial support has not only been maintained, but steadily increased and reached, in round figures, 105,000 dollars in the year 1920-21.

The necessity for increased food production stimulated this movement during the War, and at the present time the development of Boys' and Girls' Agricultural Clubs forms an important part of what is known as "Co-operative Extension Work in Agriculture and Home Economics" in the United States. The U.S.A. Department of Agriculture and the 33 State Colleges of Agriculture co-operate in this work, which is carried on through a very complete county organisation, including provision for the furtherance of the club system. This form of practical agricultural education for young people is therefore part of a larger whole, and boys and girls appear to be participating increasingly with adults in carrying out common programmes of work. The fact that in 1920 5,048 standard clubs existed in the U.S.A., and that over 8,000 "Community programmes" (embodying special farm and home interests of men and women, boys and girls in a given locality) were developed, shows the extent to which the agricultural pursuits of the present and the rising generation have already been identified. More than 700,000 children are now enrolled in these clubs, and some idea of their activity may be gained from the fact that during the War they produced food to the value of no less than 20,000,000 dollars in a year.

Young Farmers' Clubs were instituted, on similar lines, in Canada in 1918. At the present time there are over 85,000 club

members in the Province of Manitoba alone. and considerable developments are reported in Alberta, Saskatchewan, Ontario and British Columbia.

Development in England.—The first Young Farmers' Club in this country was founded in 1921 at Hemyock, Devon, by the United Dairies, Ltd., the objects in view being the production of cleaner milk and the introduction of a heavier milking breed into the district. The fact that the club now numbers 150 Associate Members amongst local farmers, that four of the members have attended courses at Seale-Hayne College, and that other clubs are to be established, is some indication of the nature of the influence exerted on farming methods in the neighbourhood. There are now 37 clubs in England and Wales, with a membership of over 600, and there is every likelihood of considerable expansion in the near future. The existing undertakings include the rearing of calves, pigs, poultry and rabbits, bee-keeping and horticultural production. The movement in England has been carried on under the ægis of the *Daily Mail*, which was also responsible for the formation, in 1921, of the International Federation of Young Farmers' Clubs, by means of which English, Canadian and American clubs have been brought into close touch. American young farmers have visited this country, and, as a result of the enterprise of the *Daily Mail* and the generosity of the Canadian railways, 4 boys and 4 girls, selected from Young Farmers' Clubs over here by representatives of the Board of Education, Ministry of Agriculture and the National Farmers' Union, have enjoyed an educational holiday in Canada this summer. The International Federation of Young Farmers' Clubs has received inquiries from Argentina, Africa, Australia, Holland, Sweden and Russia, and interest in the movement is evidently world-wide.

Purpose, Value and Possibilities.—The primary object of the movement is improvement in the quality and quantity of foodstuffs, but it is certain that other important results are also secured. Club membership constitutes a most effective training not only in farm practice but in business methods and in social intercourse. It is a valuable form of both general and agricultural education, for it tends to evoke and increase intelligent and sympathetic appreciation of every phase of rural life. Young farmers, brought into actual contact with current agricultural problems, and provided with the latest scientific suggestions for their solution, are likely to acquire an abiding interest in the development of the industry on the most approved modern lines.



FIG. 1.—United Dairies, Ltd., Calf Club, Hemyock, January, 1922.
Members with yearling heifer calves.

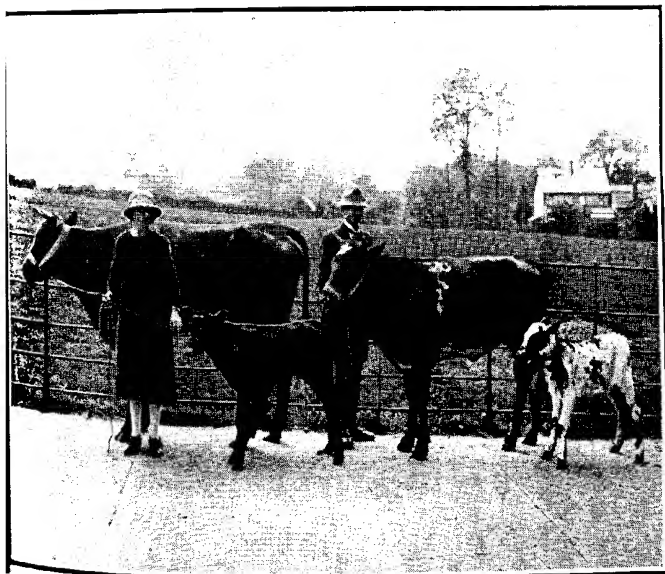


FIG. 2.—Doris Fry, United Dairies Calf Club, Hemyock No. 1, with her 1921 heifer
with calf, her 1922 yearling and her 1923 calf.

That increased demand for entry to agricultural institutions results from the educational stimulus provided by these agricultural clubs has already been demonstrated in England, and this is confirmatory of the experience of the United States. Initiation into business management at an early age is invaluable, and the control of the affairs of the club also provides opportunity for the development and exercise of those qualities which are the foundation of useful and successful public work. Viewed in this way club membership appears as a continuation of education and a preparation for practical affairs.

Assistance for Young Farmers' Clubs.—It is evident that the movement is of national importance and that the effects are likely to be as far-reaching as those resulting from such other organisations of the time as the Boy Scouts and Girl Guides. The Scheme has been fortunate enough to enjoy, from the outset, the support of the *Daily Mail*, and it is being increasingly patronised by breed societies and industrial firms. The National Farmers' Union is desirous of establishing close relations with the movement and it has been suggested that members of Young Farmers' Clubs might be enrolled as junior members of the National Farmers' Union branches. Nor is the interest of Government Departments lacking, for the Board of Education, and the Ministry of Agriculture are anxious to give every form of encouragement in their power. The foundation for work of this kind exists in the "rural bias" which the Board of Education encourages in suitable elementary and secondary schools, and of which details are available in the publications of the Board. The practical management of small live-stock in connection with the teaching of rural science in elementary schools is an interesting feature. The Ministry, through its Divisional Inspectorate, is able to give much direct assistance, and has promised to use its influence with agricultural training and research institutions with a view to facilitating provision of lectures and dissemination of information. Local Educational Authorities also are becoming increasingly aware of the possibilities of the movement, and are in most cases willing to lend the services of suitable members of their staff. There is every probability that, as in the United States, the connection between schools, local agricultural education and club organisation will become increasingly close. Officers of the Ministry of Agriculture and of the Board of Education may in their discretion do anything consistent with their official responsibilities towards furthering this movement.

Formation and Organisation of Clubs.—Those who are concerned with the furtherance of agricultural education and who may have opportunities of promoting the establishment of Young Farmers' Clubs in suitable localities will be interested in the procedure which has been followed hitherto.

A decision having been arrived at as to the kind of produce or stock which can be dealt with most suitably in the neighbourhood, a patron is secured, who will bear the initial expenses, and a small advisory committee of experienced and energetic helpers is set up. This Committee invites the young people of the neighbourhood and their parents to a meeting at which the project is outlined and club management explained. From ten to twenty of the children present (ranging between 10 and 18 years of age) then form themselves into a club, which chooses its own officers and regulates its own affairs.

With the fund supplied by the patron, or founder of the club, stock is purchased, judged and allotted by ballot to the members—a note of hand, signed by the member and backed by the parents being taken in exchange. At the end of a stated period (varying with the nature of the stock), during which inspections are made by the advisory committee, the stock is re-judged and prizes given for progress made and records kept. The animals are subsequently auctioned, the amount of original value repaid to the patron and the balance handed to the member concerned. Slight variations from this plan obtain in the case of, e.g., crop-raising clubs, but detailed information is obtainable from the Secretary, Young Farmers' Clubs, the *Daily Mail*.

At the weekly or fortnightly meetings of the club, lectures are given or discussions held. Associate Members, who have no voting power and for whom there is no age limit, are entitled to attend these meetings.

With the continued growth of the movement variations of existing methods of instituting and maintaining the clubs will suggest themselves. The establishment of contact with other rural organisations will open up new possibilities. The sympathy of country women for instance might be secured through the Women's Institutes, and the interest of officials of agricultural societies would assist in bringing the whole scheme more prominently to general notice in the showyard and elsewhere. The movement is certainly well founded already, but deserves even wider public recognition than it enjoys at present.

* * * * *

BLACK AND RED CURRANTS.

BLACK CURRANTS.*—In consequence of the losses caused by big bud, running off, and reversion, large areas of black currants have been grubbed and replanted to other crops, so that the present home production falls short of the demand, and good market prices prevail for the fruit. Though these troubles are of a serious nature, it is possible to produce satisfactory crops by planting none but true and healthy stocks of varieties suitable to the soil and district, and by exercising special care in controlling the spread of big bud and reversion, and in carrying out suitable cultural and pruning operations, which, with the aid of sufficient and suitable manures, will encourage the bushes to develop strong and healthy new shoots annually. The size of crop produced is largely influenced by the character of the soil and other conditions, and by the care and treatment given to the plants. The weight per acre may vary from 7 cwt. to 2 tons, or even more where conditions have been extremely favourable. Where experiments have been carried out the records show, however, that the crop generally averages under 1 ton to the acre. For instance, Dyer and Shrivell, in their experiments at Tonbridge for eight seasons, obtained crops varying from 15 cwt. per acre where 25 tons of London dung were used as manure, to 7 cwt. per acre where only phosphates and nitrate of soda were used. At East Malling during 1917, 1918 and 1919 the records indicate that an acre of "French" (1,210 bushes to the acre) might be expected to yield a crop varying from 17.4 cwt. to 4 cwt. Similarly, "Boskoop Giant" varied from 16 cwt. to 6 cwt.; "Victoria" from 14 cwt. to 4 cwt. and "Baldwin" from 26.8 cwt. to 18.8 cwt., according to the manurial treatment adopted. It appears that within each variety there exist strains of high productivity.

Propagation.—It is evident, therefore, that trials are necessary to ascertain the varieties which are best suited to the local conditions, after which further developments may be made by planting purchased bushes or bushes which can be propagated at home from cuttings. Before purchasing it should

* See also Black Currant Growing in Norfolk, by H. Goude; this *Journal*, April, 1923, p. 62.

be ascertained that the bushes are true to name, free from rogues, big bud disease and reversion. The bushes may, however, be propagated at home from cuttings (i.e., vigorous, well-matured young shoots, 10 in. in length) taken from bushes; but it is of the greatest importance that the cuttings be taken only from bushes known to be free from big bud disease and reversion.

Cuttings should be taken in October or November. They should be of substantial thickness and about 10 in. long with all the buds on, so that the bushes are not grown on a leg. The best growth is made if cuttings are planted on the same day that they are cut off the parent bush. The ground should be well prepared for planting and the cuttings should be put in 6 in. apart in rows $2\frac{1}{4}$ ft. apart against the side of a furrow or notch at a depth that permits two or three buds to project above the soil level. The soil is returned—on stiff soils not more than 2 in. at a time—and carefully trodden down. During the following spring and summer the surface of the soil should be kept moved to conserve moisture, and prevent the growth of weeds. The bushes should be fit to plant out at one year old.

A description of a method adopted in Norfolk for raising clean plants from spring cuttings was fully described in the August, 1921, issue of this *Journal*, p. 460.

Planting.—Black currants grow satisfactorily in varied types of soils, ranging from heavy loams to light sand, always providing that the texture permits of free rooting and that an adequate supply of moisture can be obtained. The site of the land should be both warm and sheltered, under which conditions insect life is more abundant and pollination facilitated. This is particularly important in the case of those varieties bearing flowers with the stigma projecting beyond the anthers, for in this case many of the flowers fail to become fertilised by natural processes, and there is a consequent poor set.

Before planting, the land should be well manured, and cultivated to a depth of at least 12 in. (deeper if there is a hard pan below). In practice this is preferably done for the previous crop, though further deep cultivation should be given to bring the land into a suitable condition for planting. The bushes are usually planted at 6 ft. square, though Baldwin varieties may be only from 4 ft. to 5 ft. apart. In some districts it is believed that better results can be obtained by planting bushes very much closer together.

The planting should take place preferably during the autumn, though it can be done in January and February. At the time of planting, or soon after, all growth should be cut to within two buds of the base.

Cultivation and Manuring.—After planting the land must be kept clean, free from weeds, and in a loose friable condition at the surface. In practice this is accomplished by shallow digging or ploughing up to the bushes in the winter, followed by spring and summer cultivation.

Near the bushes the digging, ploughing and cultivation should be shallow to avoid harm being done to the masses of fibrous roots.

Whilst black currants benefit from repeated applications of manure, experiments by Dyer and Shrivell, and by Hatton at East Malling, indicate that the crop is not equally responsive to all classes of manure. Farmyard manure appears the most suitable and liberal supplies of this should be given. Fish, meat and bone meal and shoddy are often used in both Kent and Norfolk in conjunction with smaller supplies of farmyard manure. The crop does not, however, seem always to respond to dressings of artificial manures. Summer mulches with farmyard manure, reeds, or spent hops prove beneficial.

Pruning.—In the winter following the planting, all the bushes that have made three or more growths at least 2 ft. long should have the weakest shoots cut back to two buds. All the shoots of the less vigorous bushes should be cut back to two buds at the base.

In later years, with older bushes, the shoots are not shortened but the bush thinned by removing the less vigorous branches each year. This encourages the development of new shoots, on which the black currant fruits best.

Though not properly forming a part of pruning operations, it is essential that the measures for the control of the big bud mite* should be carefully observed. Branches which show reversion† must be cut out, and in some cases whole bushes grubbed.

Varieties.—In a short article it is only possible to deal with such varieties as are commonly grown for market. The characters most useful for determining black currants are possibly the habit of growth of the bush, and the colour and shape of the buds and bud scales, which characters are more apparent during the winter months. There are other points of importance that help

* See Leaflet No. 1 (*Black Currant Mite*).

† See Leaflet No. 377 (*Reversion or "Nettlehead" of Black Currants*).

to distinguish one variety from another, such as :—The period of breaking into leaf—early with Baldwin and late with Boskoop; the size of the leaf as a whole; the shape of the central and lateral lobes; the depth of indentation where the lobes meet, and the indentation at the base by the leaf stalk; the leaf serration. The blossoms have individual points of difference; the length of each raceme (chain) varies from “long” in the case of Boskoop to “short” in the Victoria group. Boskoop frequently has single racemes springing from a spur, whereas three to six are common in the Victoria group. The fruit, which is of most importance to the grower, exhibits certain differences in size, flavour, and skin toughness, and these will be considered, but generally these distinctions are less dependable than those of the bush, leaf, and blossom.

The descriptions of the varieties are as follows :—

GROUP I.—FRENCH TYPE.—Bush and Leaves.—Very large, much branched bush, very compact. Moderately strong and quick grower. The buds are pink to deep red in colour, of medium size, conical shape, pointed at the apex, and somewhat tightly wrapped with bud scales. The leaves are of medium size and are pointed, *i.e.*, the lobes end acutely, the serrations of the lobes are acute, and the indentation between the central and lateral lobes is deep. The base of the leaf, on the contrary, is fairly level.

Blossom and Fruit.—One to three racemes (blossom chains) spring from a fruiting spur, each bearing from six to ten individual flowers, so that the raceme is of but medium length. The stigma (the female part of the flower) is frequently above the anthers (the male part carrying the pollen). Not all the flowers set fruit, so the trusses are short, and fruit medium sized; ripens in mid-season, very acid. The berries have a tough skin and travel well.

This variety under most conditions appears resistant to big bud, but often shows reversion.

Merveille de la Gironde, North Holland Black, Resister, Ogden's Blue, Lee's Prolific, Black Naples, Seabrook Black, Mammoth, and Westwick are varieties belonging to this group.

GROUP II.—BOSKOOP GIANT TYPE.—Bush and Leaves.—A sturdy, spreading and rather scantily branched bush of medium size. The buds are large, broad and blunt, pink to purple in colour. These buds give rise, early in the season, to large flat leaves less angular than French, and held at right angles from the stalk. The lobes are broader, and end less acutely; the serrations generally are crenate. The base of the leaf is deep, indented by the leaf stalk.

Blossom and Fruit.—The fruit spur, late in the season, frequently develops but one raceme (blossom chain), but this a long one containing from twelve to nineteen large flowers, with the stigma projecting above the anthers. The trusses of fruit are long, though many of the bottom trusses fail to set their fruit, and running-off is considerable. This type is the earliest to ripen its berries, which are moderately sweet, and provided with tender skins. To carry well, marketing should be done before the fruit is ripe. Other varieties of this group are Hoogendyk's Seedling, Prince of Wales, and Black Bunch.

GROUP III.—VICTORIA TYPE.—Bush and Leaves.—The bushes are of medium size, very erect, and the branches a very light buff colour and often forked. The buds are small, somewhat crowded, conical in shape and pointed, and of a very light green (almost white) colour; the scales are loosely arranged around the buds. The variety comes early into leaf, and the leaves are small. The lobes are irregular in shape; the terminal tending to be tri-lobed; the laterals are irregular in outline; the indentation at the meeting of the lobes is often very deep; but the base of the leaf is fairly level, or with but a shallow indentation by the stem.

Blossom and Fruit.—Usually three to six racemes (blossom chains) develop from each fruiting spur; each raceme has from eight to eleven single small flowers. In this variety many of the stigmas (female portion) are slightly above the anthers. There is some running-off in this variety, but it is not extensive. The trusses are short and crowded together; the berries ripen in mid-season, they are large, sweet, and have moderately thin skins.

Goliath, Edina, Monarch and Baug Up are well-known varieties of this group.

GROUP IV.—BALDWIN TYPE.—Bush and Leaves.—The least vigorous of all the cultivated black currants, making a dwarf though compact bush. The light green coloured buds are large and long, conical in shape, and pointed. The scales are very loose and ragged. The variety is the earliest to develop leaves; these are small and very regular. The central lobe is somewhat long, and ends acutely, which tends to give the leaf a long appearance. The indentation at the base of the leaf is very deep.

Blossoms and Fruit.—From each fruiting spur two or three racemes (blossom chains) usually develop each containing from six to twelve individual flowers, in which the stigmas (female part) are generally on a level with the anthers (male part); this apparently facilitates pollination, for little "running off" occurs and the fruit sets well. The berries are of medium size, ripening late in the season, somewhat acid, and with tough skins which allow the fruit to be marketed even when fully ripe.

Emsden Defiance and Bodenburg's Black Prince are varieties of this group.

RED CURRANTS.—The demand for this fruit is more limited, and the market is at times over-supplied. The crops are easily grown, and, where good cultivation is adopted, heavy and regular crops can be secured. The bushes are propagated from cuttings taken and planted in a similar manner to that described for black currants, though all except the three or four buds at the top of the cutting should be removed; the bushes then will remain free from suckers.

Red currants flourish best in the lighter soils, and can be grown successfully under top fruit.

Planting and Manuring.—The bushes should be set less deep than is recommended for black currants, and the distance for planting is 5 ft. square.

The bushes require less organic manure than black currants. In addition this crop is favourably influenced by artificial

fertilisers, such as potash salts given in conjunction with phosphates and nitrate of soda.

Pruning.—The red currant bush should be cut in quite a different manner to that described for black currants. The red currant bears chiefly on the fruiting spurs formed on the older wood. The aim should be to produce a bush of six or seven principal branches evenly arranged so as to form an open basin to facilitate the ripening of the fruit. Two or three hard prunings should be sufficient to obtain this. Subsequent prunings merely amount to cutting the main branches back to an outside bud to leave about 6 in. of the currant growth each year. All laterals should be cut back close to the fruit buds at the base. The summer pruning of all laterals to about 4 in. before the fruit is picked usually proves advantageous.

Varieties.—In the breeding of the cultivated red currant three distinct species have been used (*Ribes rubrum*, *R. vulgare*, *R. petraeum*), and as would be expected the characters of each of these species appear in varying degrees in most of the present varieties. Thus it is convenient to classify the varieties into groups according as their botanical characters show a strong resemblance to these three species.

Certain well known varieties are selected as types.

I. The Rubrum Group.—Varieties placed in this group have pitcher-shaped flowers, held stiffly out on wiry stems. Varieties of the Raby Castle type also have downy leaves—which is not so with the Scotch type.

(a) *RABY CASTLE TYPE*.—*Raby Castle*.—Bush and Leaves.—A medium sized bush, upright, with broad light yellowish-green leaves, very hairy on the underside.

Blossom and Fruit.—The blossom-truss, which appears before the leaves, is of medium length, bearing a number of pitcher-shaped, green flowers, without fleshy ring round pistil. The fruit is carried on stems (pedicels). The berries are of medium size and of a bright red colour, which is maintained on ripening. A fertile late-season variety.

Houghton Castle (synonym New Red Dutch).—This variety is often mistaken for Raby Castle, from which it differs by having silvery foliage. The bunches are longer, the fruit stems long, and on ripening the berries turn darker to a dull, red colour.

(b) *THE SCOTCH TYPE*.—*Scotch* (synonyms London Market, Fowler's London Red).—Bush and Leaves.—A large Bush with upright sturdy branches, bearing large buds (winter stage), and in the summer stage light green small leaves, held horizontally to the stem by stiff wiry stems. Stiffness is the characteristic of this variety.

Blossom and Fruit.—Bell-shaped light green flowers held outwards on a short wiry stem which is somewhat hairy. The berries are close together on

one side of the bunch, which is of medium length, held on a stiff wiry stem (rachis). A prolific early cropping variety of bright red berries suitable for market purposes.

II. *The Vulgare Group*.—This section contains those varieties with characteristics indicating their descent from *R. vulgare*. The flowers are very open, almost flat, and show a distinct fleshy ring round the pistil. The stems of the flower and fruit racemes are long and thin, so that the trusses hang downwards, with the fruit lying on all sides. The foliage is large and pointed, but thin. The berries are big. Varieties in this group commonly have buds which go blind, and brittle shoots which often snap off when bearing heavy crops, or when exposed to high winds.

(a) *VERSAILLES TYPE*.—*Fay's Prolific* (synonym Comet).—Bush and Leaves.—A medium bush, fairly upright, with long pointed buds, and large dark green leaves, not hairy. The tips point downwards. An early variety.

Versailles (synonyms Eclipse, Magnum Bonum).

(b) *THE DUTCH TYPE*.—*Perfection* (Laxton).—Bush and Leaves.—A small bush composed of short branches, with small buds and dark green leaves. A late variety.

III. *Goudouin Group*.—In this group are placed those varieties which exhibit characters indicating their descent from *R. petraeum*. Stout, flat, very large leaves; red shoots; claret-red coloured flowers, raceme long, held stiff, flowers open and bell-shaped, with the outer edges turning outwards rather like the flower of a Campanula. Late at starting growth in the spring, and hesitating in shedding its leaves before the winter months. Goudouin, Prince Albert and Seedless Red are varieties of this type.

IV. *Varieties Outside the Groups*.—There are some varieties with mixed characters so that they do not well come into any particular group.

Victoria (synonym Wilson's Long Bunch).—Bush and Leaves.—The growth is very straggling and uneven; the buds slender and long; the leaves brownish, with leaf stems (petioles) long, middle leaf lobe very pointed.

Blossom and Fruit.—The flowers are of the open, flat type, similar to *R. vulgare*, with a fleshy ring around the pistil. The sepals are separated and well apart. The stem (rachis) of the fruit truss is very long and moderately stiff, and the berries separated so that the bunches appear very long. Very late variety.

Marketing.—Good samples of early varieties of red currants are packed in 1 lb. punnets and sold to be mixed with raspberries for dessert. Black and red currants are also marketed in chip baskets containing 4 lb. and 6 lb. respectively. The bulk of the crop of both red and black are marketed when the berries

are quite firm in strikes of 12 lb. and in bonnets and half sieves containing 24 lb. These packages, which should be lined with clean tissue paper, should contain only sound fruit packed and no leaves. When full the paper should be folded over the top so as to make a neat appearance.

* * * * *

THE HEDGEHOG.

H. MORTIMER BATTEN, F.Z.S.

To endeavour to lay down hard and fast rules as concerns the habits of any bird or animal is invariably to invite criticism, for not only do their immediate surroundings influence their ways, but in the world of fur and feather there is just as much individuality as in the world of men. Thus has the wolf cattle-killer been known to acquire a taste for strawberries, thus has the rabbit become wedded to the art of snail-catching, and thus too we have the squirrel which kills song birds. Only one thing is invariable in wild nature, and that is its variability.

This rule, if an order which dispenses with all rules may be termed a rule, applies to the hedgehog as strongly as it does to any beast. Few creatures vary more in their habits than does the urchin of the undergrowth, regarding whom every agriculturist should have some knowledge, for it may be said that the hedgehog is everywhere beneficial to the agriculturist. Game preservation, on the other hand, stands to lose a little if this beast be too abundant, but these points will become evident as we proceed with its history.

A few notes from my own studies will serve to illustrate the variability, or rather the adaptability, of the hedgehog. Some years ago I spent a few months on an estate in Dorsetshire where hedgehogs were abundant. In that locality the undergrowth was dense and prolific, and the hedgerows grew rank with the result that the hedgehogs were surrounded by an abundance of their natural insect fare. So the gamekeepers had no quarrel with them, and I have seen a whole family of hedgehogs meandering about the keeper's garden paths at sundown. The man informed me that he had never found them guilty of egg stealing, the crime for which the animal is chiefly condemned, while he recognised the fact that such assiduous insect hunters were beneficial to his borders. Incidentally I might mention that a pied wagtail brought off her brood in a rockery about which the urchins were regularly to be seen.

My next study of the species takes us to a bleak and rocky limestone valley in the north of England. There was very little heavy timber in this valley, though the abundance of hazel bush and silver birch along the stream edge had long afforded shelter for several prosperous families of urchins.

Here, naturally, there was little insect fare, with the result that the hedgehogs had to look in other quarters for a living, and it soon became evident that they depended mainly upon the rabbits. The rabbit catcher told me that they were the worst snare robbers with which he had to contend, and if, when ferreting, we were compelled to dig, we almost as often as not unearthed a hedgehog from the burrow. Evidently they claimed free usage of the warrens, retiring there to sleep away the daylight hours.

So far as the free and adult rabbits are concerned the hedgehog is, of course, helpless, but in this locality the animals had acquired the habit of hunting out the nesting "stops," in which the newly-born rabbits lay at the end of the narrow shaft. Often these breeding burrows are so small that one would think a hedgehog could hardly squeeze into them, but he appears to have no difficulty in that way, and once he is inside the young rabbits are doomed. The hedgehog may remain in the same stop two or three days till the meal is consumed, when he moves out in search of the next. Regularly we found the animals walking about with their coats thickly matted with rabbit nesting materials, which was certainly strong enough evidence as to their habits. In many parts of the Highlands I have found the hedgehogs addicted in just the same way to rabbit hunting, which, so far as agriculture is concerned, is perhaps another point in their favour.

This beast, like every other, follows the lines of least resistance. Where insects are abundant and he need move only a few yards to fill himself on such fare, he does not acquire habits of a destructive kind. Occasional old hedgehogs may stray from the prescribed pathways of virtue, thus bringing destruction upon their race, but if the individual be trapped and killed the mischief will probably cease. If, on the other hand, insects are scarce, the hedgehogs turn to the next most fruitful source of supply. Possibly the abundance of rabbits offers an easy solution, or possibly an abundance of ground-breeding birds results in the hedgehogs of the locality becoming habitual egg and chick thieves.

I have never visited the rabbit-infested areas of Australia, but I should imagine that the hedgehog would find insect fare

none too abundant where the rabbits abound, and I would suggest that a few consignments of hedgehogs might assist the balance of nature as regards a reduction of the wild rabbit's numbers. Where, in the interests of game preservation, such beasts as the hedgehog and the stoat, and such birds as the buzzard have been practically wiped out, farmers are up against the same problem in this country, though of course on a smaller scale, as are their brothers in Australia, where the rabbit was imported without his natural foes.

Kept in an enclosed garden hedgehogs make interesting pets, and very amply pay their way by the number of noxious insects they kill. They quickly become quite tame, allowing themselves to be touched and stroked without erecting their quills, and within two days of its capture a hedgehog will take food—such as a scrap of bacon rind—from the fingers of its captor.

Though the hedgehog cannot be set down as of much value in the destruction of rats, the animal nevertheless takes rank among the natural foes of the rat and his race. I recollect one evening being roused from my work by the sound of a dead thud on the gravel path outside my window, followed by much squealing, and going out I found a hedgehog and a rat engaged in deadly combat. They must have fallen interlocked from the dense creeper above the window, but unfortunately both of them heard my steps and made off, so that I was deprived of witnessing the conclusion of the fight. On another occasion a noise of squealing at the back of some farm buildings took me to the scene, and there I found several rats in the act of mobbing a hedgehog.

It may strike some people as strange that so inactive a beast as the urchin should essay to climb into a creeper, but we need to remember that the hedgehog of the daylight hours is a very different beast from the hedgehog of the night. In the dusk of evening I have seen one of these animals pick himself up and spring off almost as nimbly as a rabbit, and certainly they can climb well. One which was kept in a garden used regularly to climb into the fruit trees and creepers which covered the boundary wall, and it was on a platform of leaves in the creeper, nine feet or so from the ground, that this animal made its winter nest.

Hibernation.—The hedgehog hibernates in the true sense. During the autumn months he lays on fat, and when the leaves begin to drift he acquires, accidentally or otherwise, an overcoat of leaves. These become impaled upon his quills, the second

layer ramming the first layer home, and so he goes his way impervious to wind and rain. As the weather turns colder he becomes more and more sluggish, and, no longer a vagrant, he spends much of his time sleeping in some cosy nook abundantly lined with leaves.

I have examined the hibernating quarters of several hedgehogs, and they vary considerably. One I found denned up in a shallow rabbit burrow. The animal was rolled up and thickly entangled in a bed of dry grass, much like a chrysalis in its cocoon, but in addition the animal had dragged quite a sackful of leaves into the burrow. It was, indeed, full of leaves, and the burrow mouth was entirely buried under the leaves which had drifted over it, so that not only was the little stronghold entirely hidden from view, but the sleeper within was certainly secure from rain and frost.

On another occasion I found a great bundle of hay in the corner of a ruined building, and investigation showed it to contain a hibernating hedgehog. Yet another of these beasts decided to hibernate among some sacks in a corner of my motor house, but had to be ejected on account of its primitive sanitary arrangements. In my boyhood one of them several times did his best to settle for the winter under a gardener's coat, which the man was in the habit of throwing down in a corner of the potting shed.

Providing the animal dens up in good health and his den is weather-proof, he will sleep without rousing from early November till the month of March.

Breeding Habits.—As is the case with the badger, mating begins immediately succeeding hibernation. According to such evidence as at present exists on the subject, the period of gestation occupies seven weeks, and since the first young are born in March—that is in the south of England—the first hedgehogs must be astir early in February. So far as I know, the sexes never den up together, and I personally have never seen hedgehogs astir before March. In Scotland the young very seldom appear earlier than mid-April. Generally there are two litters during the season—the second arriving as late as August. The latest nest I ever heard of contained newly born young in the middle of September, but this was in Highland country.

The young are born blind, and the quills are present at birth, but they are flexible and white. They first leave the nest with their mother at the age of about eight days, but generally keep to the densest thickets, so that they are very seldom found at

this early age. They remain with their mother until full grown, which accounts for the frequent discovery of a number of hedgehogs together at night-time during the summer months.

Though normally silent animals, hedgehogs possess considerable vocal powers. When trapped they utter a squalling scream which can best be described as midway between the squealing of a rabbit and the sounds of a cat-fight. The young utter various bird-like notes to attract their parents, among these notes being a distinct whistle not unlike that of the blackbird.

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DATES OF BLOSSOMING OF PLUMS.

H. V. TAYLOR. A.R.C.Sc., B.Sc.,
Deputy-Controller of Horticulture,
Ministry of Agriculture and Fisheries.

CULTIVATORS of plums from early days appear to have had varied experiences in obtaining satisfactory crops with all kinds of plums; and some varieties were soon termed "bad croppers." Whilst in most cases plums of the gage type, such as Coe's Golden Drop and Late Orleans, appeared in this category, there were other varieties which cropped well in some orchards but proved failures in others, just as Rivers' Early is doing at the present time. The reasons for these varying crops have never been completely understood, but step by step scientific workers are throwing light on these obscure problems.

Assuming that the soil and the tree growth are satisfactory for crop production, it is, in the main, still necessary for the female portion of the blossom (the stigma) to receive the pollen from the male portion before fertilisation can proceed, and the production of a real fruit can commence. Now the blossom of the plum contains both the stigma and the anthers carrying the pollen grains, but for some reason, still obscure, it is the exception rather than the rule for the pollen grains to be active on the stigma of the same variety. In other words, many varieties of plums are self-sterile, and the stigma of one variety needs to be supplied with pollen from another. Pershore Yellow and Purple egg plums, Monarch, Victoria, and Czar, are exceptions, for they possess considerable powers of self-fertility and are able to produce satisfactory crops without the aid of other kinds.

Whilst this has been suspected for many years, its truth has only been confirmed by the work of recent research workers. and it emphasises the need for full details regarding the

behaviour of the blossoms of the varieties usually planted in commercial orchards. Even this would scarcely suffice because a variety of plum remains in blossom, and especially full blossom, for but a few days; nor do all kinds commence to flower at the same time. Mr. Udale, from 21 years' recording work at the Worcestershire County Council Garden at Droitwich with 96 varieties of plum, found the average difference in the time of blossoming of plums, between the earliest varieties to flower and the latest, to be about 18 days. The intervals naturally vary with the prevailing weather, and were as short as 8 days in 1917, and as long as 39 days in 1913. Mr. Cecil Hooper, of Wyre College, and others have made observations with similar results.

It is evident that much can be done towards ensuring better crops of fruit by arranging trees of these stone fruits in the orchard in such a way that with the self-sterile varieties there are interplanted some varieties to facilitate pollination. The important point seems to be that the two varieties must have flowering periods which are similar or which overlap to some extent. Thus, Belle de Louvain would appear to be a suitable pollinizer for Pond's Seedling and *vice versa*, but in normal years neither might be of use for, say, Rivers' Early Prolific, for which Pershore Yellow Egg, Czar, or Prince of Wales would be preferred. More records and research are needed before advice in all cases as to the best pollinizers can be given, but fruit growers are indebted to Mr. Udale, Mr. Hooper, and Mr. Crane of John Innes Institute, Merton, and others, for the investigations which they have made into the sterility and fertility of varieties and their order of flowering.

From their records it would appear that plums should be grouped as follows, for flowering and fertility* :—

Early Flowering Varieties.

Black Diamond (S), Prince of Wales (F₁), Curlew (S), Monarch (F₁), Jefferson's Gage (S), Coe's Golden Drop (S), Denniston's Superb (F), President (F₂), Old Greengage (S).

Mid-season Flowering.

Rivers' Early Prolific (F₂), Bryanstone Gage (S), Wyedale (S), Victoria (F), Early Orleans (F₂), Farleigh Damson (F₂), Pershore Yellow Egg (F), Pershore Purple (F), Kirker Blues (S), Magnum Bonum (F).

Late Flowering.

Czar (F), Washington Gage (S).

Latest.

Pond's Seedling (S), Gisborne's Early (F), Kentish Bush (F₂), Belle de Louvain (F₂).

* (S) means self-sterile.

(F) signifies that the variety is strongly self-fertile.

(F₁) occasionally self-fertile, and (F₂) rarely self-fertile.

The result of the cropping of 38 varieties of plums during 21 years at the Droitwich Gardens, recorded by Mr. Udale, gave the following average crop per tree:—Pershore Yellow Egg (70 lb.), Smith's Purple Prolific (55 lb.), Victoria (54½ lb.), Rivers' Early Prolific (44 lb.), Prince of Wales (34 lb.), Monarch (34 lb.), Czar (32 lb.), Jefferson (29 lb.), Belle de Louvain (28 lb.), Pond's Seedling (14 lb.), Czar (11 lb.), and Coe's Golden Drop (7 lb.). The average yield during 21 years of 51 trees of 37 different varieties was 40½ lb. per tree per year.

The trees on which the records were made were planted in 1896, and in the following table there is set out the behaviour as regards blossoming and cropping during the periods of time each of seven years duration.

Whilst there is no definite correlation between the yield and the period of flowering, it does seem to be the case that early blossoming in March is not conducive to high yield, probably because of frost risk.

Year.	Earliest and latest to blossom of 38 varieties of plum.	No. of days difference.	Yield per annum of 5½ trees.	
1900 ...	April 19—April 28 ...	9 ...	228½	<i>First 7 years:</i> Total yield 7,020½ lb. Average yield per tree per annum— 18½ lb.
1901 ...	April 16—April 27 ...	11 ...	2,110½	
1902 ...	April 5—April 24 ...	19 ...	557	
1903 ...	March 4—April 7 ...	34 ...	93	
1904 ...	April 11—April 24 ...	13 ...	1,303	
1905 ...	March 29—April 18 ...	20 ...	2,713½	
1906 ...	March 28—April 15 ...	18 ...	14½	
1907 ...	April 1—April 21 ...	20 ...	4,359½	<i>Second 7 years:</i> Total yield 19,875 lb. Average yield per tree per annum— 53 lb.
1908 ...	April 13—May 2 ...	19 ...	4,550	
1909 ...	April 12—April 27 ...	15 ...	2,966½	
1910 ...	April 5—April 22 ...	17 ...	2,736½	
1911 ...	April 5—April 22 ...	17 ...	1,603½	
1912 ...	March 17—April 6 ...	20 ...	2,076	
1913 ...	March 9—April 17 ...	39 ...	1,583	
1914 ...	March 29—April 15 ...	17 ...	3,600	<i>Third 7 years:</i> Total yield 18,203½ lb. Average yield per tree per annum— 48 lb.
1915 ...	April 7—April 26 ...	17 ...	1,154½	
1916 ...	March 29—April 22 ...	24 ...	2,081½	
1917 ...	April 30—May 8 ...	8 ...	7,332	
1918 ...	March 20—April 4 ...	15 ...	303	
1919 ...	April 18—May 4 ...	16 ...	2,048	
1920 ...	March 4—March 28 ...	24 ...	1,684	
Total yield in 21 years ...			45,098½	lb.

Average difference between first and last
varieties to commence to flower 18½ days.

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PEPPERMINT: ITS CULTIVATION AND DISTILLATION.

A. H. HOARE,

Ministry of Agriculture and Fisheries.

THE Oil of Peppermint of commerce is an extremely pungent volatile oil obtained by distillation of the stems and leaves of species of *Mentha*, a genus of the family *Labiatae*. This oil is the source of the well-known peppermint flavour and aroma, possesses marked medicinal properties, and finds a ready market amongst the confectionery, pharmaceutical and perfumery trades. The oil is also used in the production of *creme-de-menthe* and other liqueurs.

Peppermint has been cultivated for centuries in the Mitcham district of Surrey, where the acreage once totalled 300 acres, but at the present time is probably not more than 150 acres. Market Deeping in Lincolnshire and Hitchin in Hertfordshire have also been large centres for this industry.

The species grown is *Mentha piperita*, and two varieties are recognised by growers, one being known as black mint (*Mentha piperita nigra*) and the other as white mint (*Mentha piperita alba*). The former is recognised by its purplish stems and dark olive green foliage, while the latter has green stems and lighter foliage, and is generally of less vigorous growth. Also, the leaves of the black mint are much more finely serrated. Although the oil derived from white mint is of a finer quality and commands a higher price than that from black mint, the latter yields more, and is the variety generally grown in this country.

Cultivation: Suitable Soils and Situations.—Although an indigenous plant, and therefore more at home in this country than lavender, peppermint has been found to succeed commercially under somewhat similar conditions to those required by that crop, and is therefore generally grown in association with it. It does well in light calcareous soils and is therefore a very suitable crop for the chalk lands, providing, of course, there is a sufficient depth of soil above the chalk. Friable sandy loams or gravels will grow the crop also, in fact any soil is suitable when well drained, except heavy clay.

It has been found, however, that both the quantity and the quality of the oil is influenced by soil and situation. The crop pays best in open sunny situations where the rainfall is not normally excessive during the growing months—April to August

—moist heavy weather affecting the oil production considerably. Being herbaceous it is unaffected by winter conditions, and may therefore be grown where lavender would be killed by the frost.

Preparation and Planting.—Having selected the site, care must be taken to ensure its thorough cultivation, bearing in mind that the crop can profitably occupy the land for four or five years if well prepared beforehand.

Unless the land has previously carried a crop which demanded good cultivation, such as potatoes, it should be ploughed and cross ploughed, and if a hard pan is present that must be broken with a sub-soiler.

A good dressing of farmyard manure—from 15 to 20 tons per acre—should be ploughed in, and it will pay to see that the land is thoroughly cleaned and brought into a good state of fertility. The preparation of the land will be done during the autumn and winter, and at the final ploughing it should be laid up in lands about 5 ft. or 6 ft. wide, with furrows about 18 inches wide between. The usual practice is to have the beds about the width of the cart wheels so that the latter run in the furrows, with the least damage to the mint. This bed system of cultivation is the best, as it must be remembered that weeding and harvesting is all done by hand, and pathways at suitable distances apart greatly facilitate operations. Land so prepared will have a good tilth by the spring, when the beds are levelled down with hand rakes and are ready for planting.

In commencing the cultivation of this crop for the first time it will of course be necessary to buy in a stock of mint. Every care must be taken to ensure that the true plant is obtained. It should be purchased if possible from an actual grower, in a recognised peppermint district, otherwise it is a risky matter. This question of stock is a very important one.

Peppermint is propagated by means of young plants which arise in spring from the "runners" or creeping root stocks which are produced in quantity on established beds. A free production of young plants is often induced by covering the beds with friable soil from the furrows. Planting is done as early as plants become available, usually during March and April. The plants are dibbled in about 12 in. apart to ensure an even spread. It is estimated that about 42,000 plants are required to plant an acre.

In newly planted ground peppermint requires a good deal of hand weeding in order to keep the land free from weeds until the mint is established. A hoe cannot be used without injury



FIG. 1.—Harvesting Peppermint.

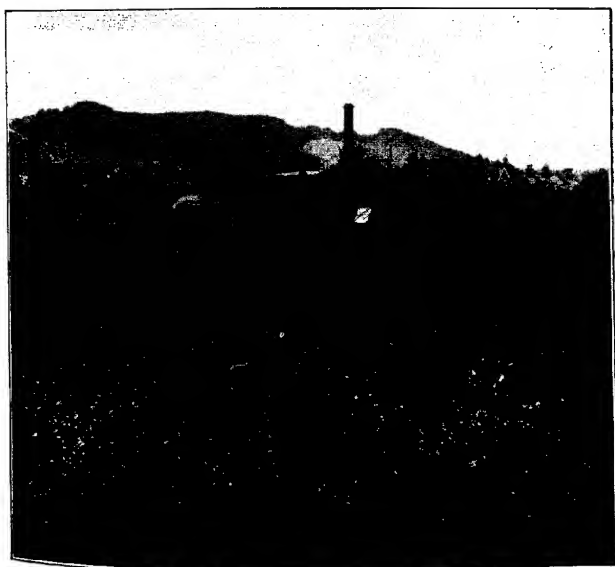


FIG. 2.—Peppermint Field at maturity. A Distillery in the background.

to the growing plants. The furrows between the beds must also be kept free from mint, so as to keep a free passage.

After the beds are cleared in the autumn they should receive a dressing of dung, and the beds are ploughed over to divide the runners and cover them with soil. Fish guano and Peruvian guano applied in the spring have been found to give good all-round results in the past, but many growers now apply a dressing made up of sulphate of ammonia, superphosphate and sulphate of potash according to the nature of the land. It certainly pays to apply this annual dressing after the first year and while the crop occupies the land. The potash is especially valuable as it has been found to help the plants resist the rust disease referred to below. A useful dressing would be 1 cwt. of sulphate of ammonia, 2 cwt. of superphosphate, and $1\frac{1}{2}$ cwt. of sulphate of potash to the acre.

Harvesting the Crop.—The crop is ready for harvesting about the second week in August, just before the flowers begin to open. The stills are then got to work and distilling goes on night and day without a break until the crop is finished. Crop time may last 3 or 4 weeks according to the area under cultivation and the rate at which the distilling can be undertaken. As mentioned above, the whole of the plant above ground contains oil and is harvested.

Cutting is done with small sickles known as mint hooks, and should only proceed in fine weather. As the mint is cut it is laid on the beds in long even rows to dry. After lying for a day or two in fair weather it is gathered in small heaps and left again for two days, being turned once in the meantime. Given good weather, the mint should then be in a fair condition for "still-ing," and is then made up into large bundles of about 1 cwt., enveloped in mats, and is carted away to the distillery. In this condition the mint will keep indefinitely, and harvesting is then independent of the capacity of the still to deal with it.

In cutting the mint it is important to see that no noxious weeds are reaped with it and conveyed to the still. Such weeds as ground ivy (*Nepeta Glechoma*), cat mint (*Nepeta cataria*), and goose foot (*Chenopodium* spp.), are particularly troublesome, and must be guarded against, otherwise the flavour and colour of the oil may be injured.

Distilling.—The cost of putting down a distilling plant is a considerable item. For this reason, in a peppermint-growing district, the smaller growers generally take their crop to the distillery of larger growers, where it is distilled for an agreed

sum. This is a convenient arrangement and accessibility to a local still is one of the main considerations when commencing to grow this crop on a small scale. On the other hand there are several manufacturing firms who are now making small efficient stills suitable for small growers, and whose advice should be sought.

On account of the bulky nature of the crop the stills must necessarily be of large dimensions. They are best constructed of copper throughout, and are generally built to take charges of from 15 cwt. to 1 ton at a time.

The capacity of the copper depends largely on the state of the crop when it is brought to the still.

A type of still in use amongst several growers is illustrated in the accompanying photograph. The stills are constructed with a false perforated bottom. Water is poured into the empty still until it rises about 2 ft. into the charge chamber. The mint is then packed in and firmly trodden down until the load is level with the top of the still. The still head is then let down by pulleys and clamped down into a waterseal joint.

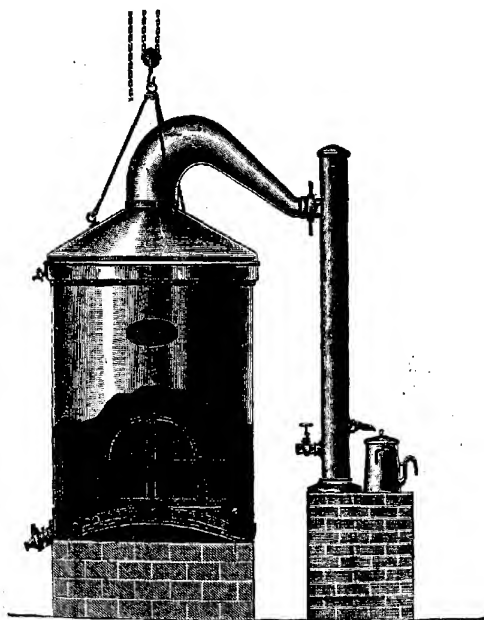
The distillation is conducted by boiling the water beneath the charge chamber by means of steam conveyed from a boiler at pressure to a coil, the top of which should be well beneath the false bottom. The application of direct heat to the stills is now obsolete on account of the risk of burning, etc.

The distillate will commence to pass over in about half an hour, and complete distillation of the charge usually takes about six hours, by which time all the oil will have passed over. The oil is completely insoluble in water, and readily separates out in the separator as it comes from the condenser. After each charge the oil is "taken off" by first pouring off the "mother liquor," which is saved and put back into the next charge along with the overflow in the tanks, the oil being then poured into Winchestersters and weighed, so that a check can be kept upon the yields.

After each distillation the charges are drawn by special gear, the spent mint being carted back to the fields by the returning carts, and rotted down for manure. This spent mint forms good organic manure, and should be mixed with the farmyard dung which is applied to the land in the autumn as above stated.

Yield.—It is difficult to give any definite figures as to yield. As stated above the oil production is extremely variable, being influenced considerably by the season, soil, and situation, as also is its quality in respect of flavour and odour. When grown

under conditions which tend to assist oil production, and given a fair season which has been warm and dry, a yield of oil at the rate of from 10-12 lb. to the ton of partly dried mint would be a good return. An average crop of green mint grown under favourable conditions on established beds would be between 3 and 4 tons per acre. A good average yield for well-cultivated commercial crops would therefore lie between 30 and 40 lb. of oil to the acre. Under adverse conditions only half these figures might apply, whereas record yields have been obtained under extremely favourable conditions as high as 100 lb. to the acre.



A modern Peppermint Still, showing new pattern Condenser.

The oil is usually disposed of straight away to the merchants, by whom it is mellowed in storage before being sold to the consumer. The product is extremely sensitive to light and temperature, and must be stored in complete darkness, preferably below ground in concrete chambers.

Diseases.—Peppermint is often badly attacked by Mint Rust, sometimes referred to as "Snuff disease" by growers,

caused by *Puccinia menthae*. This disease has been known to destroy whole beds of mint, and must be constantly watched for, and precautions taken against its spread should it appear. It is easily distinguishable, as all stages appear on the one host, the bright orange cluster cup phase of the fungus, which appears in the early summer on the stem, being especially noticeable. This disease is most troublesome during wet seasons, and it should be borne in mind that all species of wild mints are often badly attacked, and may provide a source of infection if left undestroyed.

The only remedy, once the disease has appeared, is to remove the affected plants entirely and burn them. Affected plants can be distinguished very early in the season, before spores are produced, by their pale leaves and distorted, stunted stems. The mycelium of the fungus winters over in the underground portion of the plant, therefore plants once attacked are likely to remain attacked unless destroyed.

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NOTES ON MANURES FOR NOVEMBER.

SIR JOHN RUSSELL, D.Sc., F.R.S.,
Rothamsted Experimental Station, Harpenden.

The Cropping Policy.—One of the most serious questions now engaging the farmer's attention is the cropping policy that should be followed on the farm. It is an extraordinarily difficult question, and one that in the end each man must decide for himself after full consideration of all the circumstances of his own case. The fundamental idea underlying these notes, and indeed all of the writer's work, is that whether a man lays down more grass or whether he keeps up his arable area, he must produce good crops or he cannot meet his standing charges. Unmanured arable crops give less profitable returns in good times, and in bad times they involve a greater loss of money, than crops which are properly manured. Much of the grass land of the country, both hay and grazing, can be considerably improved and made more profitable by suitable manuring. There is, of course, such a thing as over manuring, but in ordinary farm practice this is very rare; it is much more common to see unsuitable and therefore wasteful manuring. In the writer's experience, however, a crop which is unprofitable when properly manured, does not become profitable

by giving less manure. In his view the proper way to meet low prices is to go carefully over every item of expenditure and every process in the production of the crop to discover whether it is possible to bring down the cost of production per ton or per bushel of produce; to see also if it is possible, by using improved varieties, by better schemes of manuring, or by better soil management to obtain larger yields at the same or only slightly greater expenditure of money. If when all this is done, it still appears that the farmer's best efforts will involve him in a loss, then let him put his land into some other crop.

Can Kainit be applied late to Wheat?—On chalk soils kainit is well known to have a beneficial effect on wheat, and a correspondent asks whether it is safe to apply this substance after the wheat is up. There is probably little risk of injury in the autumn or early winter, but it is unwise to use kainit in this way on arable crops; its proper use is to go in with the seed or earlier.

Kainit, as is well known, is the least concentrated of the potassic fertilisers; it contains salt, and in the case of German kainit, a magnesium compound as well. The salt and probably the magnesia have value on light soils and on mangolds, though they are not as useful as potash itself. The so-called "extra kainit" and the potash manure salts are both more concentrated, supplying a larger amount of potash per ton; they may prove more economical where cartage or freight charges are heavy.

Manuring of Leys: Use of Longer Leys.—Special attention should be given to the leys, as where a mixture has been sown in place of pure clover it may be found desirable to keep the ley down for another year. A dressing of basic slag or finely-ground mineral phosphate (120-mesh sieve) is useful in early winter if the clovers are well established, but where the clover has failed in many places it is probably better to wait till spring and then apply a nitrogenous manure to bring on the grasses. The best time for manuring of leys, however, is when the nurse crop is being sown; the slag or mineral phosphate put on then helps the young clovers considerably. It may happen, however, as at Rothamsted this year, that potassic fertiliser is also necessary. Clovers sown in a nurse crop of barley which had received potash as well as phosphates made much better growth and gave a heavier yield than when the barley had received phosphates only. It is only when the manuring of the nurse crop has been omitted that it becomes necessary to put manure on to the stubbles of the nurse crop.

A London Ash-pit Refuse.—The Council of one of the large London boroughs has been pulverising refuse after the removal of rags and bones and has obtained a product in a fairly fine state of division :—

Moisture	...	...	...	...	18.20
* Organic Matter	...	...	...	...	20.08
Oxide of Iron and Alumina	...	...	...	...	8.68
† Phosphoric Acid	...	...	...	...	0.37
Lime	...	...	...	...	3.40
Potash	...	...	...	...	0.32
Magnesia, Alkalies, etc.	...	...	...	...	6.34
Insoluble Siliceous matter	...	...	...	...	42.61
					<hr/> 100.00 <hr/>

° Containing Nitrogen 0.36

Equal to Ammonia 0.44

† Equal to Tribasic Phosphate of Lime 0.81

This material is poor in organic matter, the chief fertilising constituent of town refuse, though it would have a good effect in lightening heavy soils. It would probably be useful to heavy land farmers if it could be obtained on the field at 3s. to 4s. per ton, though it would hardly be worth more.

If the rags and bones were left in a richer material would be obtained, but probably it is more economical to separate these substances and sell them separately.

Some Cheap Lime.—One of the large chemical manufacturers of the north is putting on the market a waste lime which has been dried and pulverised, containing about 80 per cent. carbonate of lime, or 44.8 per cent. of calcium oxide, the remainder being water, at a price of 5s. per ton. This is very cheap and should allow of the application of lime to soils badly needing it but in regard to which the cost of the dressing has hitherto been prohibitive.

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PRICES OF ARTIFICIAL MANURES.

NOTE.—Unless otherwise stated, prices are for not less than 2-ton lots f.o.r. in towns named, and are net cash for prompt delivery.

DESCRIPTION	Average Price per ton during week ending October 10th.					
	Bristol	Hull	L'pool	L'ndn	Cost per Unit at London	
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	s. d.
Nitrate of Soda (N. 15½ per cent.)	13.12	13.15	13.10	13.2	16.11	
" Lime (N. 13 per cent.) ... ..	...	...	...	12.10	19.3	
Sulphate of Ammonia, ordinary (A. 25½ per cent.)	13.9*	13.9*	13.9*	13.9*	(N)18.0	
" " " neutral (A. 25½ per cent.)	14.12*	14.12*	14.12*	14.12*	(N)18.10	
Kainit (Pot. 12½ per cent.) ... ..	...	...	...	1.17	3.0	
" (Pot. 14 per cent.)	2.2	...	2.10	2.5	3.3	
Sylvinit (Pot. 20 per cent.) ... ..	...	...	...	2.10	2.6	
Potash Salts (Pot. 30 per cent.) ... ..	...	...	...	3.10	2.4	
Muriate of Potash (Pot. 50 per cent.)	8.5	7.0	8.0	7.0	2.10	
Sulphate of Potash (Pot. 48 per cent.) ... ..	...	...	11.15	10.15	4.6	
Basic Slag (T.P. 35 per cent.) ... ..	...	...	...	3.10§	2.0	
" (T.P. 30 per cent.) ... ..	...	...	...	2.17§	1.11	
" (T.P. 26 per cent.)	2.13§	2.8§	...	...	...
" (T.P. 24 per cent.)	2.9§	2.4§	2.2§	...	...
" (T.P. 20-22 per cent.) ... ..	...	2.1§	...	2.5§	2.3	
" (T.P. 18 per cent.)	2.3§	...	1.15§	...	...
Superphosphate (S.P. 35 per cent.)	3.17	...	3.7§	3.7	1.11	
" (S.P. 30 per cent.)	3.10	...	3.0§	3.0	2.0	
Bone Meal (T.P. 45 per cent.)	9.10	...	9.0	8.7	...	
Steamed Bone Flour (T.P. 60 per cent.) ... ..	...	6.10†	6.15	6.2	...	
Fish Guano (A. 9-10, T.P. 16-20 per cent.)...	12.15	...	12.10	13.12	...	

Abbreviations: N.=Nitrogen; A.=Ammonia; S.P.=Soluble Phosphate; T.P.=Total Phosphate; Pot.=Potash.

* Delivered in 4-ton lots at purchaser's nearest railway station.

† Delivered (within a limited area) at purchaser's nearest railway station.

§ Prices include cost of carriage from works to town named. Hull prices include delivery to any station in Yorkshire; London prices include delivery within a limited area. Cost to purchasers in other districts will be greater or less according to the distance of different purchasers from the works.

MONTHLY NOTES ON FEEDING STUFFS.

E. T. HALNAN, M.A., Dip. Agric. (Cantab.),

Animal Nutrition Institute, Cambridge University.

The Use of Home-Grown Foods for Stock.—Notes have appeared in this column and elsewhere from time to time on the value and use of home-grown feeding stuffs. From the opinions that the writer has obtained from practical farmers it seems clear that there is no agreement among them on the value and use of home-grown cereals. Barley may be taken as a case in point. In the Eastern Counties generally barley is looked upon with disfavour for use with any stock other than fattening pigs. If used to any extent with breeding sows or with dairy cows it is said to dry up the milk.

On the other hand, it is a common practice in the North of England to feed barley to milch cows in conjunction with other foods. A farmer recently informed the writer that he placed great reliance on soaked barley as a milk producer, used in suitable conjunction with other foods.

In view of this lack of agreement, any positive evidence on the practical side of the value of suitable mixtures of home-grown feeding stuffs for stock is worth recording, and the writer, through the kindness of a correspondent, is enabled to record one experience on the value of home-grown foods. This correspondent has been accustomed for some time past to feed his own corn to stock with favourable results. Last year he ground up over 2,000 bushels of wheat, barley, oats and beans. The following are the mixtures he likes best for the different classes of stock:—For pigs, a mixture of 1 cwt. of wheat, 1 cwt. of beans and 3 cwt. of barley. For dairy cows and fattening cattle or young calves over two months, 1 cwt. of beans, 2 cwt. oats, 1 cwt. wheat, and 2 cwt. of pure linseed cake. The first ration has a nutritive value of approximately 1:6, the second approximately 1:4. This second ration, except possibly for the young calves, is rather narrow and it should be possible to reduce the amount of linseed cake without interfering materially with the dietetic value of the mixture.

Use of Home-Grown Linseed for Stock.—The cultivation of a breadth of linseed for stock feeding is an increasing practice. Linseed is a valuable feeding stuff for all classes of stock. It is, however, inadvisable to use it for pigs intended for bacon. Linseed as grown contains 36 per cent. of oil, and if used to any extent for pigs intended for bacon an unsuitable oily carcass will be produced. Farmers, therefore, should not use linseed in any mixtures given to pigs intended for bacon, but should confine its use to breeding stock, milch cattle and working horses.

FARM VALUES.

CROPS.	Value per Ton on Farm.	Manurial Value per Ton.	Food Value per Ton.	Starch Equivalent per 100 lb.	Value per unit S.E.	Market Value per lb. S.E.
	£ s.	£ s.	£ s.		s. d.	d.
Wheat - - - - -	7 18	0 15	7 3	71·6	2 0	1·07
Oats - - - - -	6 12	0 13	5 19	59·5	2 0	1·07
Barley - - - - -	7 14	0 12	7 2	71·0	2 0	1·07
Potatoes - - - - -	1 19	0 3	1 16	18·0	2 0	1·07
Swedes - - - - -	0 16	0 2	0 14	7·0	2 0	1·07
Mangolds - - - - -	0 15	0 3	0 12	6·0	2 0	1·07
Good Meadow Hay - - -	4 5	0 13	3 12	31·0	2 4	1·25
Good Oat Straw - - -	2 7	0 7	2 0	17·0	2 4	1·25
Good Clover Hay - - -	4 15	1 0	3 15	32·0	2 4	1·25
Vetch and Oat Silage - -	1 17	0 7	1 10	14·0	2 2	1·16

The Ostend Style.—During the season, viz., from about the middle of September to the end of March, there is always a

**Marketing of
Home-Produced
Rabbit Carcasses.**

demand in the London Markets for home-produced rabbit carcasses dressed in the "Ostend" style. It needs only a little extra care and attention to method on the part of the home producer to secure for himself a preferential position in these markets, as dealers are almost invariably inclined to favour the British produce in preference to the imported, provided it is marketed in proper condition. "Ostend" rabbits are a far more saleable commodity than a rabbit which is sold in its skin, or than the wild rabbit dressed in the markets. Indeed, dealers at times have found it profitable to skin and dress in the "Ostend" style tame rabbits coming into the market for sale in their skins. The "Ostend" method requires that the carcass should be skinned with the exception of the hind feet; the fore feet should be tucked into the ribs and the carcasses paunched in such a manner that the belly is cut open from the top ribs halfway down only, so that the liver is covered and not likely to become detached. It should be remembered, however, that in killing rabbits which are to be dressed in this style, the jugular vein should be severed and the animal bled, as the whiteness of the flesh is thereby preserved.

The Ministry understands that certain dealers* in London are prepared to take British tame rabbits in the "Ostend" style, described above, in any number from one upwards, provided (a) That they are cleanly paunched; (b) That they have been allowed to cool before being packed; (c) That they are properly packed; (d) That they are despatched so as to arrive in the market by 6 a.m.; and (e) That they are sent only in the season, i.e., during the cold weather from mid-September to the end of March. It is found that there is a prejudice against rabbits at other seasons of the year. It is alleged that producers are often so careless in preparing them for the market and in their methods of packing, that late consignments during the warm weather are as often as not unfit for human consumption when they reach the market.

Before consigning rabbits for the first time to any of the dealers, rabbit keepers should communicate with the firm direct, mentioning the fact that the dealer's name has been obtained from the Ministry.

* A list of these dealers can be obtained on application to the Ministry.

Alternative Style of Dressing.—It may be of interest to include here a description of the method of marketing followed at the Ministry's Farm Settlement, Patrington, Hull, which has proved remunerative and has given satisfaction to all concerned.

After killing, the rabbits are skinned and paunched; then hung up exactly in the same way as a sheep with a stick round the back to hold the carcass open and to display the kidneys and fat. When cold and "set" each rabbit is wrapped in butter paper and a second wrapping of newspaper. The rabbits are then packed in grass mats, the largest of which are capable of holding five to six couples, weighing about 50 lb. Smaller consignments are sent in smaller mats. This method of despatch represents a great saving as against that of packing in crates or hampers. A London firm takes all the rabbits produced at the Patrington Farm Settlement, and have expressed their willingness to accept suitable lots from other senders.

The object of these notes is to show that a little extra care and trouble in marketing rabbits have their reward in the enhanced prices realised by a finished product. A detailed description of the various steps in the preparation of rabbits for the table and markets is given in the Ministry's Leaflet No. 265.

* * * * *

THE August number of the "International Labour Review" contains an interesting article by Mr. H. M. Conacher of the

Agricultural Labour Conditions Board of Agriculture for Scotland on the regulation of agricultural labour conditions in Continental Europe.

Abroad.

"The problem," says Mr. Conacher, "depends in some part on factors of climate, land tenure and the consumption demand of the populations." For the purposes of comparison the article divides Europe into three zones—Northern, Southern and Eastern, and Mid-Europe.

In the Northern Zone the carrying-on of agricultural operations is based on the work of the whole-time labourer. Large holdings are fairly common, and the keeping of stock is closely allied with arable farming. Great Britain and Northern Germany are the most populous countries where this industrial farming exists, and the amount of labour engaged in each country is considerable.

In the South of Europe (Spain, South Italy and Sicily) the system is one of capitalist farming based on large-scale holdings. The keeping of stock is divorced from arable farming, which

tends to be exclusively a matter of grain-growing, and there is also the distinctive cultivation of the vine, olive and sugar cane. Few permanent workers are employed on such plantation systems, and the labouring classes live in large villages and seek work at the different seasons over a wide area. Hungary and Rumania are in a similar position; large estates are common, the landowner wants all his labour at certain important seasons, and little work is available in the intervals.

The Mid-European Zone is described as an area in which peasant landholders and peasant agriculture predominate. The peasant raises stock in the Alps, cultivates the vine in Italy, Spain and Southern France, and cereals in the lowlands, but wherever he is found the labour of himself and his family is the dominant factor.

Mr. Conacher goes on to discuss the conditions of the workers under the different systems, and the practicability of various forms of ameliorative measures such as land settlement and social insurance.

* * * * *

At the Annual Fruit Growers' Conference in Wellington, New Zealand, it was decided to seek powers for the Federation

**Standardising
Fruit in
New Zealand.**

to take control of standardisation, marking and advertisement, and to make a levy up to a maximum of a penny a case.

Mr. J. A. Campbell, Director of Horticulture, outlined the Department's proposals, which, he said, were intended as the first step towards getting standardised fruit on the market. Compulsory standardisation was not any part of the scheme, at present. What was wanted, he said, was the elimination of the rubbish from the market. The growers' position was absolutely critical, and a continuance of the present state of things must lead to the bankruptcy of many hard-working men. Leaflets were being issued by the Department urging:—1. The adoption of the existing standardised regulations; 2. Packing in accordance with those grades and the use of the proper labels; 3. Salesmen to display standardised fruits separate from unstandardised; and 4. Not to offer standardised fruit for sale until it had been inspected by the Fruit Inspector of the Department, who would either pass, regrade or transfer it to unstandardised, so that buyers may be able to rely on the quality of fruit bearing the label of standardisation.

* * * * *

List of Potato Varieties.—A note in this *Journal* for October, 1923, p. 669, announced that the Board of Agriculture for Scotland had prepared a list of all potato varieties. It should, however, have been stated that the price of the list is 2s. 6d., post free, from the Secretary, Board of Agriculture for Scotland, York Buildings, Queen Street, Edinburgh.

Courses at Farm Institutes.—The statement below shows the courses to be held during the 1923-4 session at Farm Institutes recognized by the Ministry. A note on the purposes of Farm Institute courses appeared in the *Journal* for September, 1923, p. 485.

Name and location of Institute.*	Description of Courses.	Fees. (Board, lodging and tuition unless otherwise stated.)
Cheshire : shire School of Agriculture, Resseth, near Nantwich.	(a) Winter Courses, of about 22 weeks' duration, in Agriculture and Horticulture. (b) Short courses in Dairying and Poultry-keeping. (c) Courses, intended for beginners, of practical training in farm or garden work.	Students resident in county, 11. per week. Other students, 11. 15s. per week.
Cumberland and Westmorland Farm School, Newton Rigg, near Penrith.	(a) Winter Course (Agriculture) of 20 weeks, October to March, in science and practice of Agriculture with special reference to Dairy-farming and Stock-rearing. (b) Three Summer Courses (Dairying and Poultry-keeping) of from 4 weeks' to 12 weeks' duration, April to September. (c) Special pupils are admitted for practical training in Farm Management.	Westmorland } students } 11. 1 Cumberland } per week. students } Students from other counties 21. per week.
Essex : Anglian Institute of Agriculture, Chelmsford.	(a) Winter School of Agriculture of 20 weeks' duration, October to March. <i>Note.</i> —There is no farm attached to the Institute. All students previous to attending this course must spend at least one year on a farm, taking an active part in all farming operations. (b) Dairy School. Three courses of from 12 weeks' to 16 weeks' duration. N.D.D. 2 years' course (6 terms): also qualifies for diploma of B.D.F.A. (c) School of Horticulture. Course of three terms, viz., Autumn Term, 3 weeks; Spring Term, 4 weeks; Summer Term, 4 weeks. Practical instruction is given at the County Gardens.	(a) Residents in administrative county of Essex and County Borough of Southend, 51. for 20 weeks. Students from outside the county, 11. per week. (b) Residents in administrative county of Essex and County Borough of Southend, nil. Pupils from outside the county, 15s. per week. (c) Residents in administrative county of Essex, and County Borough of Southend, nil. Students from outside the county 15s. per week.

* Further particulars may be obtained in each case from the Principal of the Farm Institute.

[Nov.

Name and location of Institute.*	Description of Courses.	Fees. (Board, lodging, tuition unless otherwise stated.)
Hampshire : Sparsholt Farm Institute, near Winchester.	Instruction in Agriculture, Horticulture, Poultry-keeping, Dairying and Bee-keeping. (a) One year's course in above subjects.—Winter Course of 24 weeks, October-March. Summer Course of 15 weeks, April-July. (b) One year's course should be taken in preparation for the B.D.F.A. (Butter and Cheese) certificate examinations. (c) Short courses can be arranged in special subjects.	Students resident in administrative county Hampshire, 11. 1 week. Other students, 11. 1 per week.
Hertfordshire : Hertfordshire Agricultural Institute Oaklands, St. Albans.	(a) One year's course in Agriculture, of three terms, commencing respectively October, January, May. (b) Dairying Courses (i.) One year's course, commencing October. (ii.) Summer Course, April to August. (iii.) Short courses in Special Dairy Subjects (Clean Milk Production, Soft Cheese making and Disposal of Surplus Milk). (c) 12 weeks' course in Horticulture extendable to one year. (d) Two one month courses in Agriculture for non-residential students in December and January respectively. (e) 20 weeks' course in Poultry-keeping extendable to one year.	Students resident county, 11. 15s. 1 week. Students from other counties, 21. 10s. 1 week. Day students, 10s. 1 week.
Northamptonshire : Northamptonshire Farm Institute, Moulton, Northampton.	(a) Winter Course of 22 weeks (October to March) in the science underlying the practice of Agriculture. (b) Summer Course, for Women, of 10 weeks (May to July) in Dairy Farming. (c) A limited number of Farm pupils can be taken from April to October for practical training in mixed farming with special reference to Live Stock Husbandry.	Resident pupils :— (1) From Northamptonshire, 23s. per week. (2) From outside county, 31s. 6d. 1 week.
Somerset : Cannington Court Farm Institute, Cannington, Bridgwater.	(a) Agriculture and Horticulture, one year's course, three terms each of 12 weeks' duration. (b) Dairying and Poultry-keeping—Full course, 12 weeks; short courses, 4 weeks.	Non-resident pupils :— (1) From Northamptonshire, 5s. per week. (2) From outside county, 10s. 1 week.
Staffordshire : Staffordshire Farm Institute, Rodbaston, Penkridge, Stafford.	(a) Winter Course in Agriculture for youths from 16-20 years, 22 weeks (October to March). (b) Summer courses for women in Dairying, Poultry-keeping, Bee-keeping and Horticulture, 11 weeks (April-July).	Somerset students. 15. per term. Other students. 25. p term. (For short course 17. 15s. and 21. 10s. p week respectively.) Fees for Winter Course.—Tuition fee, all students 51.; maintenance fee students resident in administrative county Stafford, 251.; students from outside the county 451.; day student 71. 10s..

Name and location of Institute.*	Description of Courses	Fees. (Board, lodging and tuition unless otherwise stated.)
<i>Staffordshire—cont.</i>		
Chadacre Agricultural Institute, Earliest, Bury St. Edmunds, Suffolk.†	(a) Course in Agriculture for male students comprising two Winter Sessions of six months (two terms) each. (b) Spring and Summer Courses (nine weeks each) in Dairying, Horticulture, Poultry-keeping and Bee-keeping, for women students.	Fees for Summer Course —Inclusive fee for students resident in administrative county of Stafford, 12l.; students from outside county, 20l. Male students — FREE tuition, board and residence to selected students. Female students — resident in the county of Suffolk; tuition and residence FREE, board 15s. per week. Students resident outside the county of Suffolk; board residence and tuition 25s. per week.
Carnarvonshire : Madryn Castle Farm School, Pwllheli.	(a) Winter Course in Agriculture for men (20 weeks), October to March. (b) Summer Course in Dairying, Poultry-keeping, Bee-keeping and Domestic Science for women (12 weeks), April to July.	(a) Carnarvonshire students, 17l. 10s. Other students, 30l. (b) Carnarvonshire students, 10l. 10s. Other students, 18l. Special Course, 35s. per week.
Denbighshire : Llyfasi Farm Institute, Ruthin.	(a) Autumn Course in Agriculture for men (8 weeks), October to December. (b) Winter Course in Agriculture for men (8 weeks), January to March. (c) Spring Course in Dairying, Horticulture, and Poultry-keeping for women (8 weeks), April to June. (d) Summer Course in Dairying for women (8 weeks), July to August.	Board, lodging, and tuition to residents in the County, 22s. 6d. per week. Non-residents, 25s. per week.
Monmouthshire Agricultural Institution, Usk.	(a) One year's Certificate Course. (b) Two years' Diploma Course. Winter Term of 22 weeks (October to March). Summer Term of 22 weeks (April to September). These courses include all branches of Agriculture. Students may specialise in General Agriculture, Dairying, Poultry-keeping and Commercial Horticulture, the last named subject being a particular feature.	Tuition, board and residence :— 15l. per session (22 weeks) for Monmouthshire students; 32l. 10s. for other students. Tuition only :— 2l. per session for Monmouthshire students; 5l. for other students.

† The authority responsible for this Institute is the Trustees of the Earl of Treagh's Foundation.

The Ministry, with the approval of the Development Commissioners and the Treasury, has awarded the following special research grants for work in connection with agricultural problems during the Academic year October, 1923, to September, 1924. These grants are in addition to the annual grants in aid made to Universities and Research Institutes for the maintenance of agricultural research departments,

<i>Institution.</i>	<i>Investigation.</i>	<i>Amount.</i>
Armstrong College, Newcastle	Research in composition of oat straw (6 months)	£ 120
Cambridge, School of Agriculture	Soil bacteriology	300
Cambridge, School of Agriculture	Statistical examination of milk records	250
Imperial College of Science & Technology	Change of seed in potatoes	60
Imperial College of Science & Technology	Mosaic disease of hops (6 months)	170
Waltham Cross Experimental Station	Fertilising effect of carbon dioxide	300
Wye, South-Eastern Agricultural College	Turnip and Swede seed beetles	130
Aberystwyth, University College of Wales	Nutritive value of grasses	150
Bangor, University College of North Wales	Dry rot of swedes	165
Bristol University	Striking of cuttings	50
Edinburgh University Animal Breeding Research Department	Breeding experiments with merino sheep	700
Imperial College of Science & Technology	Investigation of flea beetles	300
Imperial College of Science & Technology	Physiological effects of insecticides	270
Leeds University	Healing of wounds in woody plants	30
Leeds University	Breeding experiments on the colour of Wensleydale sheep	100
Midland Agricultural and Dairy College	Labour force required in production of crops, etc.	175
Oxford, School of Rural Economy	Nitrogen yield in certain soils	275
Wye, South Eastern Agricultural College	Wild white clover investigation	300
	Total	£3,735

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Lectures on the Rothamsted Experiments.—The Director of the Rothamsted Experimental Station, Harpenden, announces that during the forthcoming winter it will be possible for Mr. H. V. Garner, the Guide Demonstrator of the Institution, to give a few lectures to Chambers of Agriculture and Horticulture, Farmers' Clubs, Agricultural Societies, etc., on the Rothamsted Experiments in regard to:—(1) Manuring of Root Crops and Potatoes, (2) Manuring of Cereals, (3) Manuring of Grass Land, (4) Manuring of the Rotation, (5) The Management of Farm Yard Manure, (6) Chalking and Liming, (7) The carrying out of Field and Feeding experiments.

Any such association wishing to avail itself of Mr. Garner's services is invited to communicate with the Secretary of the Station, indicating the subject or subjects which would be of most interest to its members, and

convenient dates. No fee will be charged for Mr. Garner's services, but any association engaging him would be expected to defray his travelling expenses and to make such arrangements for the lecture as may be necessary.

Foot-and-Mouth Disease.—*Buckinghamshire and Devonshire.*—No outbreak having occurred in either of these counties since 14th and 12th September, respectively, the remaining general restrictions imposed by Orders of the Ministry were withdrawn in the case of Buckinghamshire as from 19th October and in the case of Devonshire as from 16th October.

Fresh Centres.—Since the October issue of the *Journal*, fresh centres of foot-and-mouth disease have appeared in the following places:—

- (1) 23rd September, at Whitchurch, Nr. Bristol, Somerset.
- (2) 23rd September, at Grimsby (Lindsey), Lincs.
- (3) 28th September, at Ipstones, Nr. Leek, Staffs.
- (4) 1st October, at Barnoldswick, Yorks (W.R.).
- (5) 1st October, at Adney, Nr. Newport, Salop.
- (6) 1st October, at Cranleigh, Surrey.
- (7) 6th October, at Hatfield Heath, Harlow, Essex.
- (8) 10th October, Nr. Leeds, Yorks (W.R.).
- (9) 12th October, at North Farnborough, Hampshire.
- (10) 12th October, at West Hoathly, East Grinstead, East Sussex.
- (11) 13th October, at Wigan, Lancs.
- (12) 20th October, at Sprowston, near Norwich, Norfolk.
- (13) 25th October, at North Burton, Bridlington, Yorks.

Origin.—No definite origin has been discovered for the initial outbreaks in the above-mentioned centres (1) to (7), (9) and (10).

Yorkshire.—The outbreaks near Leeds, centre (8), were attributable to the exposure of animals in the incubative stage of the disease at Whitkirk Auction Marts on 1st and 8th October, and in Skipton Market on 24th September. Animals connected with the first Barnoldswick outbreak were exposed at Skipton Market on 24th September, and animals purchased at Skipton Market were taken to the Leeds district, the purchaser subsequently exposing animals from his premises at Whitkirk Auction Marts on the dates mentioned. As distribution from these markets was considerable the Ministry imposed restrictions on movement over practically the whole of the West Riding and some adjoining portions of the East and North Ridings of Yorkshire. Other outbreaks have followed, directly attributable to the same source. It appears from first reports that infection was conveyed to the East Riding from the Leeds district before the Leeds outbreak was reported.

Lancashire (Wigan).—When the reported outbreak at Wigan was confirmed on 13th October it appeared from inquiries that certain of the diseased animals had been exposed at Chester Market on 9th or 11th October, and that the animals were possibly in an infective stage when at that market. In these circumstances the Ministry considered it necessary to impose a Prohibition of Movement Order over the whole of the area of distribution from Chester Market, including the remaining portions of Lancashire, Cheshire, Flintshire and Denbighshire not already under foot-and-mouth disease restrictions, and also a small part of Carnarvonshire. From later information it appeared that there might be another channel by which infection was conveyed to the animals brought from Chester Market after arrival at Wigan, and pending the

confirmation of this possibility the Prohibition of Movement Order was modified so as to allow movement by licence in the area referred to, except within a radius of 5 miles of Wigan. This modifying Order took effect on 16th October.

Summary of Outbreaks.—(27th August–25th October, inclusive. The following shows the number of outbreaks which have occurred in various counties since the present series of outbreaks commenced on 27th August:—

<i>County.</i>	<i>No. of Outbreaks.</i>	<i>County.</i>	<i>No. of Outbreaks.</i>
Buckinghamshire ...	5	Lincs (Lindsey) ...	1
Cheshire ...	25	Norfolk ...	3
Denbighshire ...	4	Salop ...	14
Devonshire ...	4	Somerset ...	7
Essex ...	5	Staffordshire ...	1
Flintshire ...	9	Surrey ...	3
Gloucestershire ...	1	East Sussex ...	1
Hampshire ...	7	Yorkshire (E.R.) ...	1
Lancashire ...	19	Yorkshire (W.R.) ...	28
		Total ...	138

No. of Animals slaughtered.—The total number of animals slaughtered in connection with these outbreaks is as follows:—

<i>Cattle.</i>	<i>Sheep.</i>	<i>Pigs.</i>	<i>Goats.</i>
4,061	5,910	2,532	9

Compensation.—The gross compensation (estimated) payable for these animals will amount to about £134,000, but it is estimated that about a quarter of this sum will be recouped by the salvage of healthy carcasses.

Restrictions on Movement.—The appearance of fresh centres has necessitated the imposition of restrictions covering the usual 15 miles radius, but as indicated above, this radius had to be extended in the case of Yorkshire, Lancashire and Cheshire, where important markets appeared to have been infected.

Warning to Farmers, etc.—The appearance of new centres of the disease of unaccountable origin in widely separated localities is very disturbing, and notices have been issued through the Press and the Branches of the National Farmers' Union, to farmers and dealers in live stock, impressing upon them the importance of keeping a close watch upon their animals and reporting at once to the Police any suspicious symptoms on the mouth or feet of stock. Assistance has also been rendered by the British Broadcasting Co. in bringing to the notice of farmers and others "listening in," through the medium of the wireless news bulletins, the Orders made by the Ministry in certain of the districts. This was notably the case on Saturday and Sunday evenings, 13th and 14th October, in connection with the issue of the Prohibition Order over South Lancashire, Cheshire and North Wales, at a moment when there were the usual week-end difficulties of publishing urgent Orders of this nature.

Leaflets issued by the Ministry.—Since the date of the list given on page 377 of the July issue of the *Journal*, the following new leaflets have been issued.

- No. 184.—Alsike Clover.
- „ 332.—Carnations.
- „ 399.—Red Clover.

The following leaflets have been revised.

- No. 21.—The Warble Fly.
- " 105.—Wart Disease.
- " 192.—Farm Butter-making.
- " 266.—Ropy Milk.
- " 295.—Marketing of Eggs.
- " 302.—Silver Leaf Disease in Fruit Trees.
- " 331.—The Canning of Fruit and Vegetables.
- " 366.—The Manufacture of Whey Butter.

The following leaflets have been re-written.

- No. 182.—Crimson Clover.
- " 280.—Sainfoin.
- " 294.—The Housing of Laying Stock.
- " 317.—The Rearing of Chickens.

Technical Advice for Farmers.—The Development Commissioners and the Treasury have agreed to an expenditure of £28,500 in the year 1923-4 on the maintenance of Advisory Officers in entomology, mycology, chemistry, and veterinary science, at the thirteen Provincial Advisory Centres established by the Ministry of Agriculture. These are at Aberystwyth, Newcastle-on-Tyne (Armstrong College), Bangor, Bristol, Cambridge, Cardiff, Newport (Salop, Harper Adams College), Leeds, Manchester, Sutton Bonnington (Notts, Midland College), Reading, Newton Abbot (Devon, Seale Hayne College) and Wye; ten centres in England and three in Wales. At each, there will now be an Entomologist and a Mycologist, and at seven of them there will be Chemists, and at three, Veterinarians. The Centres which are on this occasion having additions made to their staffs under this scheme are Harper Adams College, which gains an Entomologist, Armstrong College, Bristol University, Seale Hayne College, each of which gain a Mycologist, and Armstrong College and Bangor College, which will have new Veterinary Advisory Officers.

This position represents a distinct and noteworthy advance in the scheme for the provision of advice to farmers on technical matters. The organisation of that scheme, as may be remembered, is on the basis of the County, the Province and the Research Station. In the County, the Agricultural Organiser is the chief officer and he is usually in charge of an expert agricultural staff, competent to deal with inquiries from farmers and others on points of recognised agricultural practice. The Province consists of a group of counties ranged round the Agricultural Department of a University or an Agricultural College, the staff of which Department is available for advising agriculturists on the more intricate and difficult problems of agricultural practice. Such advice, however, is usually passed on to farmers through the County Agricultural Organisers. Attached to the University Department or College Staffs are the special Advisory Officers, whose numbers are given above, who devote the whole of their time to the investigation of special problems confronting farmers in the Province and to advising according to the results of their investigations and their knowledge.

Agricultural Research Scholarships.—The Ministry, on the recommendation of the Advisory Committee on Agricultural Science, and with the concurrence of the Development Commissioners and the Treasury, has awarded *Research Scholarships*, of the value of £200 per annum, and tenable

for three years, to the following candidates:—Mr. D. I. Evans (University College, Aberystwyth, for Plant Physiology); Mr. I. A. Galloway (Royal (Dick) Veterinary College, Edinburgh, for Veterinary Science); Mr. R. P. Hobson (London University, for Chemistry); Mr. J. P. Maxton (Glasgow University, for Economics); Mr. J. H. Motion (Edinburgh University, for Animal Pathology); Mr. Wm. Williams (University College of North Wales, Bangor, for Chemistry); Mr. S. S. Willmott (Imperial College of Science and Technology, for Chemistry).

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REPLIES TO CORRESPONDENTS.

Sainfoin.—L.N. asks what crops should follow sainfoin and how long before sowing the new crop a sainfoin ley should be ploughed up.

Reply: As stated in Leaflet No. 280, barley, on light soils, follows it with great advantage and on thin, dry soils unsuitable for turnips, rape and mustard often follow sainfoin successfully. On other soils there is a wider choice, but it is advisable to select a crop less susceptible to wireworm which is usually rather prevalent in a ploughed up sainfoin ley. Wheat, for this reason, is not often taken after sainfoin, but it is not unusual after ploughing up the ley in the autumn and leaving it to weather during the winter to sow oats in the spring. In that case the application of manures at seed time will generally carry the crop over the danger of wireworm attack. Beans are also taken after sainfoin and also, if the soil is suitable, turnips or potatoes. At any rate the ley should be ploughed up as early as possible and left during the winter.

Farm Values of Home Grown Feeding Stuff.—B.A. asks how to work out farm values of cabbages and beans.

Reply: The method of working out the food values per ton is partly explained in Leaflet No. 396. For hay and straw, however, instead of taking the (starch equivalent) unit value for maize, the unit value for dried brewers' grains is taken. For vetch and oat silage the average between the two (maize and dried brewers' grains) is taken. The manurial values are based on figures in Bulletin No. 73 of the University of Leeds and the Yorkshire Council for Agricultural Education. The starch equivalent is taken from column 15 (net digestible energy as starch) in the Ministry's Miscellaneous Publication No. 32 ("Rations for Livestock"). The protein content is not used in estimating cash values but, as explained in Leaflet No. 388, needs to be considered in compounding rations.

Moisture Content of Cereals.—C.B. asks what is the moisture content of cereal grains.

Reply: Figures for the average marketable product, given in the Ministry's Miscellaneous Publication No. 32 ("Rations for Livestock") are between 13 and 15 per cent. At the time of threshing the figure is very variable. It may be over 20 per cent. if the crop has been got in under bad weather conditions or it may be about 13 per cent. Afterwards the figure varies with the weather and in a damp spell the grain can easily absorb a few per cent. of moisture.

Eradication of Fleabane.—D.C. asks for information.

Reply: Common Fleabane (*Pulicaria dysenterica* Gaertn.) grows on moist road sides, ditch banks and badly drained pastures and increases chiefly by

means of a creeping root-stock, which is not extremely deep-seated. (Occurring as it does on clayey soils or on sandy soils over clay, thorough drainage is of great value in its eradication. Persistent cutting with a scythe (see paragraph 4 (b) on page 5 of Leaflet No. 112) will greatly weaken the plants by preventing the storage of food for future use. Ploughing up and cultivation of an infested field offer the best chance of permanently cleaning the land.

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NOTICES OF BOOKS.

The Journal of the National Institute of Agricultural Botany. No. 1, 1922.—(Published by the Institute, Huntingdon Road, Cambridge, price 1s.) The appearance of this new Journal is the result of a decision of the Council of the Institute to collect in one annual publication the reports of all scientific work carried out by the different branches, and to include a brief statement of the proceedings of the Fellows of the Institute. The Journal includes the reports of trials carried out in 1922, together with the reports of the Official Seed Testing Station for England and Wales and of the Potato Synonym Committee, which have been hitherto published separately. The present publication will appear every spring, while the Annual Report of the Council and the Accounts will continue to be issued in the autumn.

Elementary Agricultural Science.—(William Smith. London: Oliver and Boyd.) This little book extends to about 175 pages and contains 61 illustrations. It deals with agricultural science in a simple manner, to meet the needs of pupils who are still at school and require guidance of a more elementary character than is supplied in the many existing good books of a more advanced type. It is really a suggestive outline of principles, intended to inspire the pupil with a wish to learn more about agriculture. To this end it deals briefly with soils and their cultivation, the plant and its growth, manuring, the various crops, rotations, crop diseases and pests, and weeds of the farm. At the end of each chapter is given a short series of questions which the pupil can usefully set himself to answer. Mr. Smith's work can safely be placed in the hands of young people between the ages of 9 and 18.

Guide to Current Official Statistics.—(First issue, 1922, pp. 162, H.M. Stationery Office, price 1s.) This guide has been prepared at the instance of the Permanent Consultative Committee on Official Statistics, and aims at enabling persons who are using these statistics to ascertain readily what has been published during the year on any particular subject.

The guide is divided into two parts: (1) a list of publications containing statistics grouped, usually, under the respective public departments, and (2) a subject index to the publications included in (1). In addition to this, by a system of cross reference under the main headings of the subject index, a ready means is provided of tracing a publication on a relatively minor subject. In an introduction general instructions for using the guide are given.

This book and the subsequent issues will be a great assistance, indeed a necessity, to those engaged in statistical research or to others whose work involves the consultation or use of official statistics.

The Farmer's Raw Materials.—(James Hendrick. Edinburgh: W. Green & Son, Ltd., 1923, 211 pp., 6s.) This is the second of the new Scottish Series of Junior Agricultural Text-books, of which *Farm Book-keeping* by John Kirkwood has previously appeared, while *Dairy Farming* by Professor R. H. Leith will follow shortly. It is pointed out in the general preface that while higher agricultural students of University standard are well supplied with excellent text-books, few up-to-date manuals exist which are suitable for students of the intermediate grade attending Farm Institutes, extension lectures at agricultural colleges, or similar courses. While the series is intended to have as its viewpoint the agricultural and educational conditions peculiar to Scotland and the north of England, the bulk of the material will be of general application, and to judge from the standard of the two books already issued, there is good ground for the hope expressed that the publications will be found useful further south.

The author of this simple but informative account of the farmer's raw materials—air, water, soil and manure—who is also the general editor of the series, is too well known by his work at Aberdeen University for this small work to need any special recommendation. Suffice it to say that the book is intended to convey in a simple, readable manner such knowledge as is necessary to the farmer in order that he may use to the best advantage his four primary raw materials. The subject of manures, the importance of which is especially emphasised, receives particularly full treatment. The use of a certain number of chemical terms has necessarily been unavoidable in a work of this kind, but they have been limited as far as possible to those which should be familiar to every farmer and to the average boy who has received a modern elementary school education.

Foundations of Agricultural Economics—(J. A. Venn, M.A. Cambridge University Press, 1923, pp. 397, 16s. net.) This book might, perhaps, have been more fitly entitled "*The Historical Foundations of Agricultural Economics*," for it is the foundations in history, rather than in economics, with which it deals. Thus in the two chapters on that important subject in the economics of agriculture—the size of holdings—the treatment is mainly of an historical or generally descriptive character, only a few pages being concerned with this question in relation to cost of production or to other economic aspects of the subject. Similarly, the sections dealing with the fluctuations in agricultural prices between 1914 and 1922, although giving a general account of the rise and fall in prices, are almost without a reference to the fundamental economic theories, upon which such price movements are now generally believed to depend. But these are slight criticisms of a book so admirably arranged and so full of information as this is; nor can we pass over the question of the size of holdings, without reference to the extremely interesting section and tables dealing with the relative yields from large and small farms in Rumania, the only country in Europe to compile such statistics.

The book has one great merit—it is very readable. The first two chapters give a concise and attractively written account of the various systems of land tenure from the earliest times down to the present day, and the chapters dealing with "Tithe" and "Land Tax, Rates and Income Tax" are both excellent and informative. It is, perhaps, to the chapters on "Agriculture in

Peace and War," and "The Wheat Supply of the United Kingdom," that the reader will turn with most interest. In the former, an account of the "ploughing up campaign" undertaken by the Food Production Department, with a description of the organisation, and an analysis of its effect, is given. It is followed by a discussion of the difficulties of maintaining the increased arable area thus brought into being, after the fall in prices, which began in 1920, had set in. In the chapters on the wheat supply, a short historical survey is followed by an historical account of the various attempts that have been made to maintain corn prices by legislation, and the circumstances which led to, and the results which followed, the repeal of this legislation.

An excellent account of Agricultural Co-operation is given in a chapter on this subject, comparing the widely different forms co-operation has assumed in different countries.

A chapter on agricultural statistics, again treating the subject from an historical point of view, and some useful appendices, conclude this admirable and scholarly book.

Farm Live Stock of Great Britain.—(Professor Robert Wallace assisted by Professor J. A. Scott Watson. Edinburgh and London: Oliver and Boyd, 5th Edition, 1923, 868 pp., 30s. net.) The new edition of this widely appreciated work, which deals with the most important section of our farming system, is notably issued in the joint names of two successive Professors of Agriculture at Edinburgh University—the first British University to grant a degree in agriculture. Though it extends to 868 pages and contains 442 plates and 111 text figures, it is not to be regarded as containing an exhaustive account of every breed. It does, however, give such an account of all breeds of horses, cattle, sheep, goats, pigs and sheep dogs as will suffice to meet the needs of most farmers and students, and is undoubtedly the finest single volume of its type published within the Empire.

As an example it may be remarked that Devon and South Devon cattle are dealt with in 9 pages, consideration being given to origin and history, description, distribution, economic value for beef and milk, and prominent breeders. The principles of live stock breeding cover 18 pages; the breeds of cattle 230 pages; such matters as calves, grazing cattle and their diseases, house-feeding of cattle, dairying and management of dairy cows, 125 pages. Other classes of farm live stock are dealt with on similar generous lines, and there are numerous appendices of considerable value and interest. The illustrations are, in the main, of the highest degree of excellence, but in a few cases—as is so common in photography of this class—the animal is placed before a bad background which breaks the outline and renders it indistinct. Altogether this volume can safely be regarded as a sound work of reference.

ADDITIONS TO THE LIBRARY.

Agriculture, General and Miscellaneous.

- Smith, W.—Elementary Agricultural Science. (175 pp.) Edinburgh and London: Oliver & Boyd, 1923. [63(022).]
 Stoklasa, J.—Die Beschädigungen der Vegetation durch Rauchgase und Fabrikserhalationen. (510 pp.) Berlin: Urban & Schwarzenberg, 1923. [614.7; 68.11(02).]

Field Crops.

- North of Scotland College of Agriculture.*—Bull. 28 :—Reports on Field Experiments with Oats, Turnips and Potatoes, 1919, 1920, 1921. (76 pp.) Aberdeen, 1923. [63.314; 63.332; 63.612.]
- Le Blé : Production; Industries de Transformation; Commerce.* Comptes Rendus des Travaux de la Semaine Nationale du Blé, Paris, Janvier, 1923. (600 pp.) Paris : Dubois & Bauer, 1923, 20 fr. [63.311; 664.6.]
- Minnesota Agricultural Experiment Station.*—Bull. 204 :—Wheat and Flax as Combination Crops. (21 pp.) St. Paul, 1923. [63.311; 63.34111.]
- East Malling Research Station.*—Sixth Report on the Trial of New Varieties of Hops, 1922. (33 pp.) East Malling, 1923, 6d. [63.3451.]
- U.S. Department of Agriculture.*—Bull. 1174 :—Hungarian Vetch (11 pp.) Washington, 1923. [63.33(4).]

Plant Diseases.

- North of Scotland College of Agriculture.*—Bull. 29 :—An Experiment on the Control of Finger-and-Toe by Liming. (15 pp.) Aberdeen, 1923. [63.24.]

Live Stock.

- Iowa Agricultural Experiment Station.*—Bull. 215 :—Cane and Beet Molasses for Fattening Lambs. (30 pp.) Ames, 1923. [63.631; 043.]
- U.S. Department of Agriculture.*—Bull. 1166 :—Apple By-Products as Stock Foods. (39 pp.) Washington, 1923. [63.60432.]
- North Dakota Agricultural Experiment Station.*—Bull. 167 :—The Northern Pig—Its Breeding and Management. (50 pp.) Agricultural College, N.D., 1923. [63.64.]

Dairying and Food.

- Whyte, R. A.*—Dairying in the Netherlands : A Study and a Comparison. (36 pp.) Dublin : Alex Thom & Co., 1922, 1s. [63.7(499).]
- Mattick, A. T. R.*—The Production of Clean Milk. (53 pp.) London : The Dairyman, Ltd., 1923, 1s. [614.32.]
- U.S. Department of Agriculture.*—Bull. 1171 :—The Manufacture of Camembert Cheese. (28 pp.) Washington, 1923. [63.736.]
- U.S. Department of Agriculture.*—Dept. Circ. 276 :—Inspection of Milk Supplies. (37 pp.) Washington, 1923. [614.32.]
- U.S. Department of Agriculture.*—Farmers' Bull. 1359 :—Milk and its Uses in the Home. (19 pp.) Washington, 1923. [63.71.]

Veterinary Science.

- U.S. Department of Agriculture.*—Farmers' Bull. 1390 :—Parasites and Parasitic Diseases of Sheep. (53 pp.) Washington, 1923. [59.169.]
- Illinois Agricultural Experiment Station.*—Circ. 269 :—The Common Animal Parasites of Swine. (20 pp.) Urbana, 1923. [59.169.]
- Minnesota Agricultural Experiment Station.*—Technical Bull. 5 :—Bacteriology and Pathology of Sterility in Cattle. (91 pp. + 22 plates.) St. Paul, 1922. [619.2.]

Poultry.

- Lewis, H. R.*—Productive Poultry Husbandry. Fifth Edition. (605 pp.) Philadelphia and London : J. B. Lippincott Co., 1923, 10s. 6d. [63.651(02).]
- U.S. Department of Agriculture.*—Farmers' Bull. 1337 :—Diseases of Poultry. (40 pp.) Washington, 1923. [619.5.]
- Missouri State Poultry Experiment Station.*—Bull. 28 :—Feeding for Eggs. (18 pp.) Mountain Grove, 1922. [63.651 : 043.]

Economics.

- Aereboe, F.*—Allgemeine landwirtschaftliche Betriebslehre. 6te Auflage. (700 pp.) Berlin : Paul Parey, 1923. [338.1(02).]
- Turnor, C. and Gilbert, B.*—Where Are We Going? A Manifesto to All who Live on or by the Land of England. (90 pp.) London : Cecil Palmer, 1923, 3s. 6d. [338.1(02).]
- Johnston, A. B.*—The Agricultural Tragedy or Acts and Actors. (45 pp.) London : Simpkin, Marshall, Hamilton, Kent & Co., 1923, 1s. [338.1(04).]
- Steen, H.*—Co-operative Marketing : The Golden Rule in Agriculture. (376 pp.) New York Garden City : Doubleday, Page & Co., 1923, \$1.00. [334.6(02).]

